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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

TECHNOLOGY

FEB 03 2003

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## APPLICANTS: PRZYTULLA *et al.*

APPLICATION NO.: 09/525,526

Group Art Unit: 3727

Filed: March 15, 2000

Examiner: J. Merek

FOR: PLASTIC CONTAINER

Atty. Docket No.: 2511-092-999

## **BRIEF ON APPEAL**

## Assistant Commissioner for Patents

**Box AF**

Washington, D.C. 20231

Siri:

This is an appeal from the decision of the Examiner, dated July 30, 2002, finally rejecting claims 27-29 and 35-36. An Original and two copies of this Brief are being submitted pursuant to 37 CFR 1.192(a).

## **1. REAL PARTY IN INTEREST**

The real party in interest is the assignee of the above-identified application, Wiva Verpakkingen B.V., a Netherlands corporation.

## **2. RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences associated with the present application.

### **3. STATUS OF THE CLAIMS**

Claims 27-33 and 35-45 remain in the application. Of these, claims 30-33 and 37-45 have been allowed by the Examiner<sup>1</sup>. Claims 27-29 and 35-36, which were finally rejected in

<sup>1</sup> An after-final amendment was filed on December 17, 2002. In an Advisory Action mailed January 16, 2003, the Examiner stated that, for purposes of appeal, the amendment would be entered, whereupon claims 30-33 and 37-45 would be allowed and claims 27-32 and 34-36 would be rejected. It is believed that the Examiner meant to say that

(continued...)

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the office action mailed July 30, 2002, are the subject of the present appeal. A copy of claims 27-29 and 35-36 appears in Appendix A.

As to the rejections, claims 27-29 and 35-36 were all rejected: (1) under 35 USC 102(b) as being anticipated by WO 90/30585 to "Wheaton"; (2) under 35 USC 103(a) as being unpatentable over USP 3,780,899 to "Roper" in view of USP 3,985,257 to "Shaffer", and (3) under 35 USC 103(a) as being unpatentable over DE 9408722.9<sup>2</sup> in view of USP 3,780,899 to "Roper".

#### **4. STATUS OF AMENDMENTS**

An after-final amendment was filed on December 17, 2002. The after-final amendment sought to cancel claim 34 and add claims 37-45. In an Advisory Action mailed January 16, 2003, the Examiner indicated that for purposes of appeal, the after-final amendment would be entered. As explained above, upon entry of the after-final amendment, claims 30-33 and 37-45 are allowed, and claims 27-29 and 35-36 are finally rejected.

#### **5. SUMMARY OF THE INVENTION**

The invention of independent claim 27 is directed to a plastic blow-molded barrel 10. The barrel has a barrel body provided with a top surface, a bottom surface, and four substantially identically shaped, convex side surfaces 24a, 24b, 24c, 24d (Page 4 after line13 & Fig. 1, both as amended 11/08/01), each side surface connected to two adjacent side surfaces at rounded corners 26a, 26b, 26c, 26d (Page 4 after line13 & Fig. 1, both as amended 11/08/01), the bottom surface and four side surfaces having a unitary, or "one-piece" construction. The barrel body has a horizontal stiffening element that is formed as an indentation (Fig. 4) located between the top surface and bottom surface, running along a circumference of the barrel body. The convex side surfaces and the rounded corners impart

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<sup>1</sup> (...continued)

claims 27-29 and 35-36 would be rejected, since claims 27-29 and 34-36 were finally rejected in the July 30, 2002 final office action and claim 34 was canceled in the December 17, 2002 after-final amendment.

<sup>2</sup> The Examiner mistakenly referred to this reference as "DE 940872".

an approximately square-shaped cross-section to the barrel body (See Fig. 1; see also page 4, lines 11-13).

The invention of claim 28 calls for the top, bottom and side surfaces to all have unitary (one-piece) construction.

The invention of claim 29 recites that the stiffening elements can be designed as open U-shaped or V-shaped rib-like forms (20) that run toward the inside and/or to the outside.

The invention of claim 35 recites first and second side bungs (14), each side bung formed on the top surface (See Fig. 1) adjacent to oppositely facing first and second of said four side surfaces 24a, 24b, 24c, & 24d.

The invention of claim 36 recites a foot hoop (18) extending around a circumference of the barrel body, the foot hoop configured to allow rolling of the barrel on a floor.

## **6. ISSUES PRESENTED FOR REVIEW**

1. Whether the § 102(b) rejection of claims 27 - 29 and 35 - 36 by Wheaton is proper.
2. Whether the § 103(a) rejection of claims 27 - 29 and 35 - 36 over Roper in view of Shaffer is proper.
3. Whether the § 103(a) rejection of claims 27 - 29 and 35 - 36 over DE 9408722.9 in view of Roper is proper.

## **7. GROUPING OF CLAIMS**

For purposes of this appeal, claims 27-29, 35 and 36 stand or fall together.

## **8. ARGUMENT**

### **A. REFERENCES RELIED UPON BY THE EXAMINER**

WO 95/30585 to "Wheaton" describes a plastic keg comprising three molded parts – a central main part, a lower end part, and an upper end part, each of which are injection molded from thermoplastics material, and then welded together at weld lines 17, 18 (See Wheaton, Fig. 2. At page 5, last paragraph, Wheaton specifically disassociates itself from a plastic blow molded construction: "Unlike blow-moulded containers, such a keg will have a working pressure in excess of approximately three bars and will not show any significant increase in volume when pressurized to that level."

USP 3,780,899 to "Roper" discloses a metal container having a rectangular tubular body section 21 sealingly joined to separate top 50 and bottom 70 panels by curled lock seams 61, 71 (See Fig. 2). The tubular body has a generally square-shaped cross section (see Fig. 10) with upper 30 and lower 31 portions integrally joined together by a center concave smooth and rounded belt 29.

USP 3,985,257 to "Shaffer" discloses a cylindrical plastic drum 10 (having a circular cross-section) that may be blow-molded, and is constructed with integrally formed rolling hoops 12, 13.

DE9408722.9 teaches a blow-molded thermoplastic container having a circular (Fig. 5) or rectangular (Fig. 1c) cross-section.

Table 1 below indicates which of the features in pending claim 27 are present in each of the four references cited by the Examiner.

	Plastic blow-molded	Four substantially identically shaped, convex side surfaces	Indentation	Unitary (one-piece) construction
Wheaton			X	
Roper		X	X	
DE '722.9	X			X
Shaffer	X			X

Table 1. Features Found in References Relied on By the Examiner

## B. REJECTION UNDER 35 USC 102

### 1. Requirements for Establishing a *prima facie* Case of Anticipation

To establish a case of *prima facie* anticipation, the reference must teach each and every element of the claim. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference."

*Verdegall Bros. V. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed.

Cir. 1987). “The identical invention must be shown in as complete detail as is contained in the . . . claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, *i.e.*, identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

## **2. Rejection of Claims 27-29, 35 and 36 under 35 USC 102**

Claims 27-29, 35 and 36 were rejected under 35 USC 102(b) as being anticipated by Wheaton. In formulating the rejection of the claims, at page 2 of the July 30, 2002 office action, the Examiner reasoned as follows:

Regarding claim 27, the limitation of blow-molded does not add any structure that is not found in the reference. Once the welding is accomplished the construction is unitary. The unitary construction and blow molding do not preclude the weld lines. The container of the instant invention is placed in a separable mold that will impart molding lines in the final product. Moreover, it has been well settled that the patentability of a product claim is not determined by the process by which it is made. See Fig. 4, where it is shown that the corners are rounded and the cross-section is square shaped. The container side walls are convex on the interior surface. See Fig. 3 which shows the stiffening element which is the groove 20 and is “U” shaped. Regarding claim 34, the lid is removable at the weld line 19 by cutting. Regarding claim 36, item 16 on either end is the foot hoop. (Emphasis added).

For reasons stated below, the Examiner’s reasoning, and the rejection under 35 USC 102, are traversed.

## **3. Wheaton Does not Teach Each and Every Element of Independent Claim 27**

Wheaton does not teach a “plastic blow molded barrel” or a structure having “unitary construction” or “convex side surfaces”. For these reasons, it is submitted that pending independent claim 27, and dependent claims 28-29 and 35-36 are not anticipated by Wheaton.

### **a. Wheaton does not disclose a “Plastic Blow-Molded Barrel”**

Claims 27-33 and 35-36 are all directed to a “plastic blow molded barrel”. In formulating the rejection of claims 27-29, 35 and 36 as being anticipated by Wheaton (WO 95/30585), the Examiner stated on page 2 of the July 30, 2002 office action, that “the limitation of blow-molded

does not add any structure that is not found in the reference.” The Examiner’s statement is traversed.

The expression “plastic blow molded” is not a statement of ‘purpose or intended use’ of the article in question. Indeed, “plastic blow molded” limits the *structure* of the claim, and so must be treated as a claim limitation. See MPEP 2111.02 (August 2001). It is further noted that the expression “plastic blow molded” refers to a category of objects, and one skilled in the art would consider it so. Appendix B contains a list of US patents whose titles include the term “plastic blow molded”, evidencing that those skilled in the art employ this expression to refer to a category of objects. Further evidence of this can be found in Appendix C, which includes pages from [www.fortrecoveryindustries.com/plstblw.htm](http://www.fortrecoveryindustries.com/plstblw.htm) which refers to “plastic blow molded containers” (especially bottles), [www.hitecmetalgroup.com/plastic.htm](http://www.hitecmetalgroup.com/plastic.htm) which refers to “plastic blow molded products”, <http://ptdc01.bd.ps.edu/training/bm.html> which refers to “plastic blow-molded part”, and [www.caseexpress.com/casestyles.htm](http://www.caseexpress.com/casestyles.htm) which refers to “plastic blow molded cases”.

In view of the above examples, it is evident that the expression “plastic blow molded” is used by those skilled in the art to refer to a class of objects, and the device disclosed in Wheaton clearly does not belong to this class. More significantly, however, Wheaton specifically disavows a blow-molded container. “Unlike blow-moulded containers, such a keg will have a working pressure in excess of approximately three bars . . .” (See Wheaton, page 5, last paragraph). In view of all of the foregoing, it is submitted that Wheaton does not teach a “plastic blow molded barrel”, as recited in pending claim 27.

**b. Wheaton does not disclose “Unitary Construction”**

As the term is conventionally used, “unitary construction” refers to “one-piece” construction and so does not include “welding” (such as disclosed in Wheaton). Appendix D presents the first page of U.S. patent no. 5,012,614, which shows that the term “blow-molded unitary” (present in the title) is clearly associated with “one-piece construction made by blow-molding” in the abstract. U.S. patent nos. 6,331,054 (“unitary one-piece body”) and 4,662,515 (“unitary one-piece blow-molded containers”), also evidence that those skilled in the art associate “unitary” with “one-piece”.

This association is not limited to US patents, but also extends to conventional usage of the term “unitary” in industry. Appendix E, for example, presents web pages from

[www.kangaco.com/storm.html](http://www.kangaco.com/storm.html), which states “Unique unitary construction (made from one piece of material) limits number of seams” and web pages from [www.nokona.com/body\\_protect.html](http://www.nokona.com/body_protect.html), which states “Assuring maximum protection against hard blows the pads are constructed in one-piece, of molded, unitary construction”.

Finally, it is noted that the American Heritage College Dictionary, 3<sup>rd</sup> Ed. (See Appendix F), defines unitary as “[o]f or relating to a unit” or “[h]aving the nature of a unit”, while “unit” is defined as “[a]n individual, a group, a structure, or other entity regarded as an elementary constituent of a whole”. Thus, even employing a dictionary definition, the term ‘unitary construction’ implies “a construction having the nature of a elementary constituent of a whole” – i.e., a single-piece forming the whole, or what is known in the art as an “one-piece” construction.

Wheaton clearly does not teach a unitary construction. For example, on page 2, Figure 2, shows a main part 11, a closed lower end part 12, and an upper end part 14, which are injection moldings of a thermoplastic material that are joined together by welding at weld lines 17 and 18. Thus, Wheaton teaches three parts that are manufactured separately and then welded together. Consequently, Wheaton’s device is not “a construction having the nature of a elementary constituent of a whole”.

In view of all the foregoing, it is submitted that Wheaton does not disclose the ‘unitary construction’ feature of pending claim 27.

**c. Wheaton Does Not Disclose “Convex Side Surfaces”**

The Examiner argues that Wheaton’s “container side walls are convex on the interior surface”. It is unclear which figure (or, for that matter, which specific feature) in Wheaton shows this. It is further submitted that in the context of pending claim 27, ‘side surfaces’ clearly refers to the exterior side surfaces, and Wheaton’s Fig. 4 clearly does not show convex side surfaces, even those that are “convex on the interior surface” as asserted by the Examiner.

**C. REJECTIONS UNDER 35 USC 103(a)**

**1. Requirements for Establishing a *prima facie* case of Obviousness**

Three basic criteria must be met to establish a case of *prima facie* obviousness.

First, there must have been at the time of the invention a motivation to combine the references cited. *In re Jones*, 958 F.2d 347 (Fed. Cir. 1992); *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988) (holding that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art).

Second, the alleged prior art must teach or suggest all of the limitations of the claims alleged to be obvious. *In re Royka*, 490 F.2d 981 (CCPA 1974) (holding that to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art); *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991) (holding that the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in the applicant's disclosure).

Furthermore, hindsight cannot be used to reject a claim as obvious. *In re Sernaker*, 702 F.2d 989, 994 (Fed. Cir. 1983); *In re Rinehart*, 531 F.2d 1048 (CCPA 1976); *In re Imperato*, 486 F.2d 585 (CCPA 1973); *In re Adams*, 356 F.2d 998 (CCPA 1966). Consequently, it is insufficient to select from the prior art the separate components of the inventor's combination, using the blueprint supplied by the inventor. *C.R. Bard Inc. v. M3 Systems, Inc.*, 157 F.3d 1340, 1352 (Fed. Cir. 1998) citing *Fromson v. Advance Offset Plate, Inc.*, 755 F.2d 1549, 1556 (Fed. Cir. 1985) ( holding the prior art must suggest to one of ordinary skill in the art the desirability of the claimed combination)."

The Federal Circuit has suggested that "the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or modification to combine prior art references." *Id.* This is because "[c]ombining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability — the essence of hindsight." *Id.* (citing *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1138 (Fed.Cir. 1985)).

As discussed below, the 35 USC 103 rejections set forth by the Examiner, fail to meet the requisite showing of motivation to combine.

## 2. Rejection of Claims 27-29 & 35, 36

On page 3 of July 30, 2002 Final Office Action, the Examiner rejected claims 27 - 29 and 35-36 as being unpatentable over Roper in view of Shaffer, stating:

Regarding claim 27, Roper does not teach that the container is made of plastic or blow-molded. Shaffer *et al.* teaches a drum that is made of plastic and blow-molded. It would have been obvious to employ the plastic and blow molding of Shaffer *et al.* in the container of Roper to provide a container that will not corrode and to provide a method of producing the container rapidly. (Emphasis added).

For reasons stated below, the Examiner's reasoning, and the rejection under 35 USC 103 that the claims are obvious over Roper in view of Shaffer, are traversed.

On page 4 of July 30, 2002 Final Office Action, the Examiner rejected claims 27 - 29 and 35-36 as being unpatentable over DE '722.9 in view of Roper, stating:

DE '872<sup>3</sup> teaches a round or rectangular shaped container but does not teach the substantially identically shaped four sides giving an approximately square shape. Roper '899 teaches a drum with four sides with substantially the same shape giving approximately square shape. It would have been obvious to employ the shape of Roper '899 in the container of DE '722 to provide an alternative shape for the container. DE '899<sup>4</sup> does not teach the horizontal stiffening element. Roper '899 as seen in Fig. 1, teaches an indentation. It would have been obvious to employ the indentation of Roper '899 in the container of DE '872 to stiffen the sidewall. See Fig. 60<sup>5</sup> is the stiffening element.

For reasons stated below, the Examiner's reasoning, and the rejection under 35 USC 103 that the claims are obvious over DE '722.9 in view of Roper, are traversed.

### 3. There is no motivation to modify Roper in view of Shaffer

<sup>3</sup> The Examiner has cited reference "DE '872" throughout the Final Office Action; the correct cited reference is DE 9408722.9 ("DE '722.9").

<sup>4</sup> The Examiner mistakenly cited "DE '899"; the correct cited reference is "DE '722.9".

<sup>5</sup> It is completely unclear what the Examiner is referring to by this. There is no Fig. 60 in either reference. Reference numeral 60 in Roper is a V-shaped recess that extends around the top panel 50 (Col. 4, lines 8-10) and is a 'transport ring' in DE '722.9 (see Page 10 & Figs. 3a & 3b).

It is submitted that there is no motivation to modify the metal barrel of Roper having a rectangular tubular body section 21 sealingly joined to separate top 50 and bottom 70 panels by curled lock seams 61, 71, so as to make it a plastic blow-molded barrel, of the sort disclosed in Shaffer.

To modify Roper to arrive at the invention of claim 27, one would have to, at a minimum, do the following: (1) completely replace metal with plastic throughout the barrel construction; and (2) completely replace Roper's separate bottom panel connected by 'lock seams' to the tubular barrel body with a plastic blow molded construction having a bottom and side walls with unitary one-piece construction.<sup>6</sup> Nothing would motivate one skilled in the art to do so, and the Examiner's stated motivation "to provide a container that will not corrode and to provide a method of producing the container rapidly", simply does not warrant such wholesale changes.

The entire point of Roper is the 'concave belt' and the 'lock seams' (See Roper's title). The entire point of Shaffer is a blow molded drum constructed with integrally formed hoops (See Shaffer's claim 1, line 4; claim 5, line 3). Nothing in Roper even remotely mentions the desirability of plastic blow molded construction, "rolling hoops" or a need to "provide a container that will not corrode." Similarly, nothing in Shaffer refers to enhancing structural rigidity (with an indentation 29 of the sort disclosed by Roper) or a 'lock seam' to secure a top and a bottom to a tubular body. Indeed, Roper's container, with its metal construction, separate metal top and bottom panels and lock seams, is the *antithesis* of Shaffer's plastic blow molded drum.

Furthermore, Roper's claimed "solid first lock seam" teaches away from a plastic construction. Roper uses metal in its top panel, bottom panel and tubular body section so that their flanges can be "curled together completely around said container into a solid . . . lock seam" (See Roper, Claim 1, lines 18-19). Roper's construction having flanges "curled together" would not work with plastic, because curling hard plastic flanges would almost certainly break the plastic. And even if the plastic did not break, it still would not hold into a "solid first lock seam", thereby defeating the entire purpose of Roper's claimed invention. In view of the foregoing, it is submitted that one skilled in the art, upon seeing Roper's invention, would not be inclined to look to a reference teaching the use of plastic (such as Shaffer).

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<sup>6</sup> It is further noted that one skilled in the art would not use plastic to form the lock seams.

At page 5, ¶ 8 of the July 5, 2002 Office Action, the Examiner asserts that “It is notorious in the art to substitute metal for plastic as well as plastic for metal.” In view of the foregoing discussion concerning Roper’s claimed “solid first lock seam”, it is submitted that this statement clearly does not apply to the Examiner’s suggested combination which calls for replacing the metal in Roper, with the blow molded plastic of Shaffer.

Also, to the extent that Shaffer only discloses a cylindrical drum, and is completely silent about drums of any other shape, it is submitted that Shaffer teaches away from making a plastic blow-molded container that has an “approximately square-shaped cross-section.” And while, at column 1, lines 59-61, Shaffer states: “[T]he design of the drum is such that . . . different capacity drums may readily be blow-molded” (emphasis added), Shaffer is completely silent as to differently *shaped* drums being blow-molded.

For all the reasons stated above, it is submitted that there is no motivation to modify Roper with Shaffer, and so claims 27-29 and 35-36 are non-obvious over this combination of references.

#### 4. **There is no motivation to modify DE ‘722.9 in view of Roper**

The Examiner concedes that DE ‘772.9 does not teach either “the substantially identically shaped four sides giving an approximately square shape” or “the horizontal stiffening element.” For these, the Examiner turns to Roper giving, as the motivation to combine, “to provide an alternative shape for the container.” The Examiner’s stated motivation lacks any basis in fact or law.

As part of the burden under 35 USC § 103 to establish a *prima facie* case of obviousness, the Examiner must show some objective teaching in the prior art, or that knowledge generally available to one of ordinary skill in the art, would lead that individual to combine the relevant teachings of the references. *In re Lalu*, 747 F.2d 703, 705 (Fed. Cir. 1984) (“in determining whether a case of *prima facie* obviousness exists, it is necessary to ascertain whether the prior art teachings would appear to be sufficient to one of ordinary skill in the art to suggest making the claimed substitution or other modification”) (*Citing In re Taborsky*, 502 F.2d 775, 780 (CCPA 1974)). Moreover, “when determining the patentability of a claimed invention, which combines two known elements, the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.” *In re Beattie*, 974 F.2d 1309, 1311-12 (Fed. Cir. 1992) (quoting *Lindemann Maschinenfabrik GmbH*

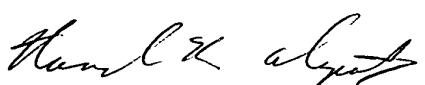
v. *American Hoist & Derrick Co.*, 730 F.2d 1452, 1462 (Fed. Cir. 1984)). The mere fact that the combination of references could be modified is not legally sufficient. *See In re Gordon*, 733 F.2d 900 (Fed. Cir. 1984); *See also In re Lawkowski*, 871 F.2d 115 (Fed. Cir. 1989) (“holding that the mere fact that the prior art could be modified would not have made the modification obvious unless the prior art suggested the desirability of the modification”). Furthermore, in *In re Lee*, 277 F.3d 1338, 1343, 61 U.S.P.Q.2d 1430, 1433 (Fed. Cir. 2002), the Federal Circuit stated that the factual question of motivation to combine for purposes of the obviousness inquiry is material to patentability, and can neither be resolved on subjective belief and unknown authority, nor stand if supported only by conclusory statements.

In the present case, the Examiner has completely failed to show any nexus between either DE '722.9 or Roper and the general desire to “to provide an alternative shape for the container”. Instead, the Examiner relies solely on the vague and conclusory motivation “to provide an alternate shape.” This does not meet the Examiner’s burden, and so the rejection of claims 27-29 and 35-36 as being unpatentable over DE'722.9 in view of Roper, should be withdrawn.

For the reasons stated above, it is respectfully submitted that the rejection of claims 27 - 29 and 35 - 36 as being anticipated under 35 U.S.C. § 102 by Wheaton is in error and should be reversed. It is further respectfully submitted that the rejection of claims 27 - 29 and 35 - 36 as being unpatentable either over Roper in view of Shaffer, or over DE '722.9 in view of Roper, is also in error and should be reversed..

Respectfully submitted,

Date: January 30, 2003

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Enclosure



## APPENDIX A

### Copy of Claims On Appeal

27. A plastic blow-molded barrel comprising:

a barrel body having a top surface, a bottom surface, and four substantially identically shaped, convex side surfaces, each side surface connected to two adjacent side surfaces at rounded corners, the bottom surface and four side surfaces having a unitary construction; and

a horizontal stiffening element that is formed as an indentation, located between said top surface and bottom surface, and runs along a circumference of the barrel body,

wherein the convex side surfaces and the rounded corners impart an approximately square-shaped cross-section to the barrel body.

28. The plastic blow-molded barrel according to claim 27, wherein the top surface, bottom surface, and four side surfaces have a unitary construction.

29. The plastic blow-molded barrel according to claim 27, wherein the horizontal stiffening element is formed as one of a V-shaped indentation and a U-shaped indentation.

35. The plastic blow-molded barrel according to claim 27, further comprising first and second side bungs, each side bung formed on the top surface adjacent to oppositely facing first and second of said four side surfaces.

36. The plastic blow-molded barrel according to claim 27, further comprising a foot hoop extending around a circumference of the barrel body, the foot hoop configured to allow rolling of the barrel on a floor.

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**APPENDIX B**

**U.S. Patents having titles with the Term "plastic blow-molded \_\_\_\_"**

**USPTO PATENT FULL-TEXT AND IMAGE DATABASE**

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**(TTL/"plastic blow molded" OR TTL/"plastic blow-molded"):** 22 patents.  
*Hits 1 through 22 out of 22*

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[ttl/"plastic blow molded" or ttl/"plastic blow-mol](#)

**PAT. NO. Title**

- 1 [6,488,883 T Process and apparatus for producing a plastic blow-molded part](#)
- 2 [6,260,724 T Plastic blow molded freestanding container](#)
- 3 [6,065,624 T Plastic blow molded water bottle](#)
- 4 [6,029,837 T Plastic blow molded bottle having hand grips](#)
- 5 [6,019,236 T Plastic blow molded container having stable freestanding base](#)
- 6 [5,906,285 T Plastic blow molded container](#)
- 7 [5,850,931 T Plastic blow molded freestanding container](#)
- 8 [5,803,290 T Plastic blow molded bottle having annular grip](#)
- 9 [5,772,056 T Plastic blow molded container](#)
- 10 [5,766,712 T Coextruded multilayer plastic blow molded container](#)
- 11 [5,732,838 T Plastic blow molded container having lower annular grip](#)
- 12 [5,685,446 T Plastic blow molded freestanding container](#)
- 13 [5,664,695 T Plastic blow molded freestanding container](#)
- 14 [5,647,516 T Plastic blow molded bottle having bellows supported dispensing spout](#)
- 15 [5,615,790 T Plastic blow molded freestanding container](#)
- 16 [5,503,308 T Plastic blow molded bottle having bellows supported dispensing spout](#)
- 17 [5,287,978 T Plastic blow molded freestanding container](#)
- 18 [5,246,148 T Dispensing closure assembly for plastic blow molded container](#)
- 19 [5,139,162 T Plastic blow molded freestanding container](#)
- 20 [5,064,080 T Plastic blow molded freestanding container](#)
- 21 [4,662,515 T Plastic blow-molded articles with fold-up sides](#)
- 22 [4,579,260 T Plastic blow-molded container having dispensing valve](#)

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**APPENDIX C**  
**Web Pages Evidencing use of term "Plastic Blow Molded \_\_\_\_"**



Plastics Technology Center

Plastics Engineering Specialists

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## Blow Molding Product Design

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Directions/Maps  
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**Hands-On Workshop**

**Fee: \$995**

**Instructors: Norman Lee and Jonathan Meckley**

### WHO SHOULD ATTEND:

Designers, process engineers, applications engineers, and others can benefit from this two-day, no-nonsense, hands-on workshop that concentrates on real life day-to-day problems faced by those working to create cost-effective, blow-molded products. Custom processors, industrial materials suppliers, new product development managers, and others working with the blow molding process can gain an understanding that will enable them to be effective when working with designers/engineers. Novice as well as experienced staff can benefit from this workshop.

### EDUCATIONAL GOALS:

The core of this intense workshop is to provide participants with an understanding of (1) plastic blow molding materials and processes to optimize the material-process selection function; (2) the basic principles of the design of a blow-molded part; and (3) the application of this knowledge to bottles. The end result is a well-designed and engineered plastic blow-molded part that will be efficiently tooled and manufactured, cost effective, and practical. This workshop features the instructions systems for organizing and managing the overwhelming mass of technical material through a phase system.

### WORKSHOP OUTLINE:

#### 1. The Basics of Blow Molding

- History
- Summary of development

#### 2. The Design Process: An Organized Product Design and

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**Hi TecMetal Group****Features**

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[View Our Directory of Services\(PDF\)](#)

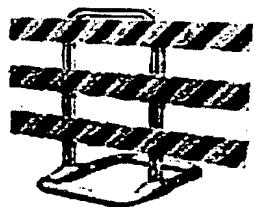
[View List of Alloys Processed at HTG \(PDF\)](#)

[HTG Supplier Quality Requirements](#)

[HTG Wins Awards](#)

**Plastic Blow Molding**

- Advantages of Blow Molding
- Markets Served



HTG Custom PlasTech, Ltd. (CPT), is a turnkey custom blow-molding business unit of Hi TecMetal Group. We manufacture plastic blow molded products for a wide range of industries.

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**Advantages of Blow Molding**

When comparing plastic blow molding technology to other plastic fabricating/manufacturing methods, advantages include:

- Produce Large Parts with Precise Dimensions
- High Volume Production
- Increased Strength and Durability due to High Density Polyethylene
- High Impact Resistant in all temperatures
- Eliminates Seam Splitting common in other methods
- High Resin Color Pellets assure Consistent Color Blending
- Light Weight but Strong
- High Quality Surface Finish

[Back to top](#)

**Markets Served**

Plastic materials are gaining popularity in many industry segments. Blow molding technology is the fastest growing segment of the plastics industry.

- Materials Handling
- Waste Management
- Construction
- Transportation
- Hospitality Industry
- Packaging
- Advertising
- Signage & Displays
- And more



**Fort Recovery  
Industries, Inc.**



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[Plumbing Hardware](#)



[RV Hardware](#)  
[Die Cast - Custom](#)

**Manufacturers of Die Cast Hardware  
and Blow Molded Containers**

**Plastic Blow Molded Containers**

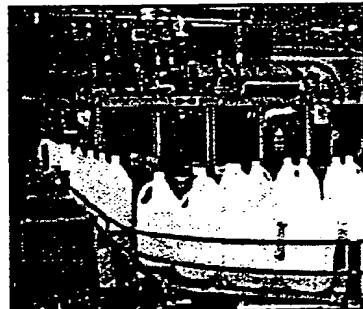


[Blow Mold - Custom](#)  
[Home](#)



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### One Gallon and Four Liter Shipping Containers



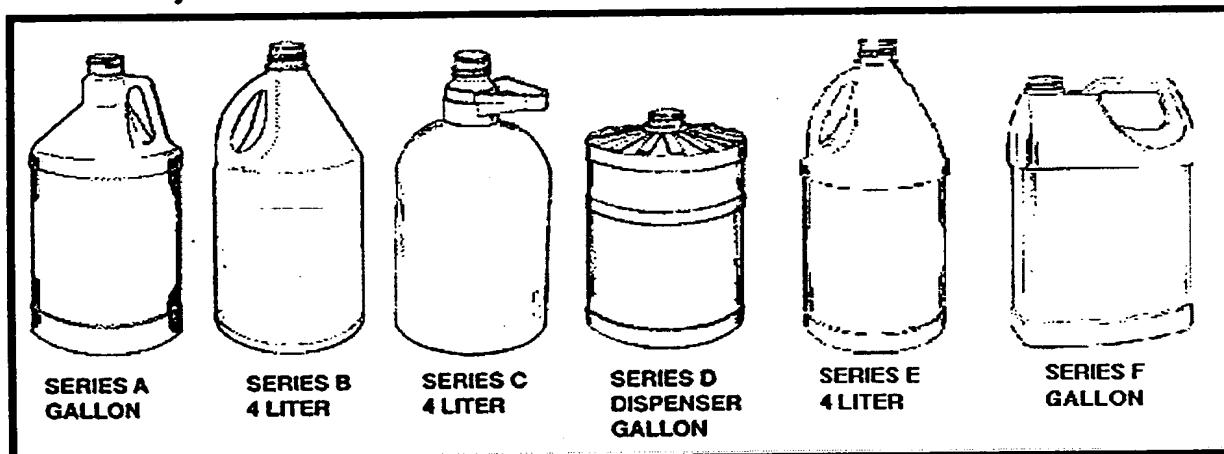
*Multi-Cavity Production*

Model	X	Y	Z
Series A	11 7/8	6 1/8	-
Series B	13 7/8	6 1/8	-
Series C	11 1/4	5 3/16	-
Series D	10	6 1/4	-
Series E	13 5/8	6 1/8	-
Series F	11 3/4	7 1/2	4 1/4

(height)

(width or  
diameter)

(depth)



**SERIES A  
GALLON**

**SERIES B  
4 LITER**

**SERIES C  
4 LITER**

**SERIES D  
DISPENSER  
GALLON**

**SERIES E  
4 LITER**

**SERIES F  
GALLON**



### Fully Equipped In-House Testing

- \* Pressure
- \* Drop
- \* Vibration
- \* Static Load
- \* Particle Count

VARIETY OF APPLICATIONS - LARGE SCREENABLE AREA'S - STANDARD AND MODIFIED NECK FINISHES - FROM BULK TO BULK/PACKAGING - STANDARD AND CUSTOM COLORS - MOST MODELS IN BULK/PACKAGING - CLEAN ROOM CAPABILITIES

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## Welcome to Case Styles and Products.

- Case Styles
- Injection Molded Cases
- Copolymer/Polypropylene
- ABS Cases
- ABS Mini Cases
- Vacuum Formed Cases
- Blow Molded Cases
- Roto-Molded Cases
- Shipping & Bulk Containers
- Steel & Aluminum Cases
- Sewn Cases
- Custom Services
- Info & Quotes
- Specials
- FAQ
- Contact Us
- Search

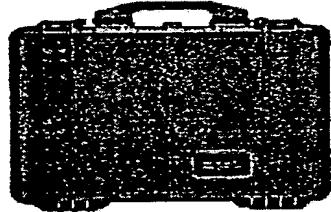
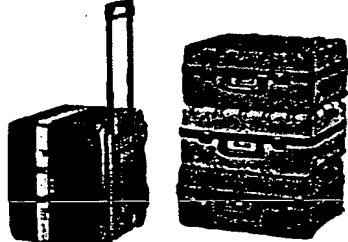
Listed below are the different case styles to choose from. See our standard stock sizes cases that are available or let us help you build a case to your specifications. Make your traveling smooth with our cases. Take a look to see what we have!



[View Cart](#)

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### Case Styles To Choose From...

	<p><b>Plastic Injection Molded Cases</b> - Copolymer/Polypropylene or ABS. Watertight, Airtight &amp; Crushproof. These cases may be used for carrying or shipping. All sizes are available for immediate delivery.</p>
	<p><b>Plastic Vacuum Formed Cases</b> - High Density Polyethylene. These cases may be used for carrying or shipping. Many stock sizes to choose from as well as non-stock sizes. Standard and recessed hardware is available.</p>
	<p><b>Plastic Blow Molded Cases</b> - High Density Polyethylene. These cases are used for carrying equipment or make a great case to resell your product in. A lightweight inexpensive way to carry or store your equipment.</p>

Whi-

First, a  
choose

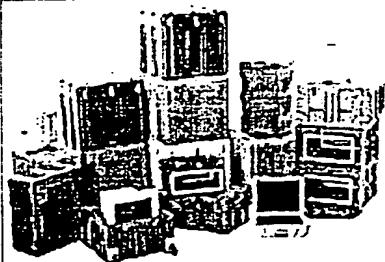
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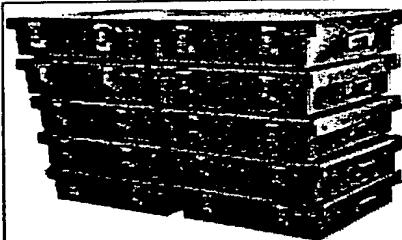
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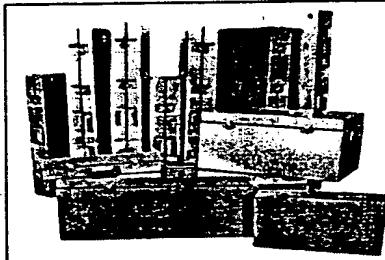
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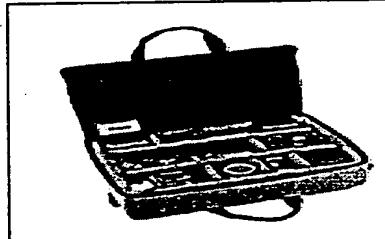
Plastic Roto-Molded Cases - High Density Polyethylene. Airtight, Watertight & Rugged. These cases are used for carrying and shipping. All hardware is recessed. Custom foam and interior options are available. Over 200+ sizes to choose from.



Plastic Shipping & Bulk Handling Containers - High Density Polypropylene. These cases are used for carrying and shipping. Cases are custom fit to your equipment. Lightweight for shipping or bulk handling. Cases are recyclable. Cut your shipping costs way down using these containers. Custom foam interior and interior options are available.



Steel & Aluminum Shipping Containers - Choose between steel or aluminum. These cases are used for carrying or shipping. Cases are custom fit to your equipment. Custom foam and interior options are available.



Sewn Carrying Cases - Choose between a variety of fabrics. These cases are used for carrying. Cases are custom fit to your equipment. Custom foam, interior and exterior options are available.

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09/525,526

**APPENDIX D**

**U.S. Patents equating "Unitary" Construction" with "One-piece" Construction**

# United States Patent [19]

Newby, Sr.

[11] Patent Number: 4,662,515

[45] Date of Patent: May 5, 1987

[54] PLASTIC BLOW-MOLDED ARTICLES WITH  
FOLD-UP SIDES

[75] Inventor: John P. Newby, Sr., Wake County,  
N.C.

[73] Assignee: Southern Case, Inc., Raleigh, N.C.

[21] Appl. No.: 840,775

[22] Filed: Mar. 18, 1986

[51] Int. CL<sup>4</sup> ..... B65D 6/12; B65D 6/16

[52] U.S. Cl. ..... 206/349; 220/4 F;  
220/6; 312/258; 312/257 A; 312/DIG. 33

[58] Field of Search ..... 220/6, 4 F; 312/257 SM,  
312/DIG. 33, 257 R, 257 SK, 258, 257 A, 261;  
206/349

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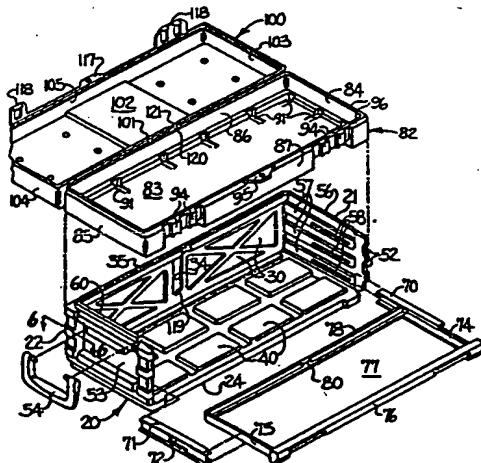
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Primary Examiner—Joseph Man-Fu Moy  
Attorney, Agent, or Firm—Bell, Seltzer, Park & Gibson

## ABSTRACT

The plastic blow-molded container of the present invention is illustrated in the form of a tool chest including a lower tool compartment that is initially blow molded in a flat condition with side walls being simultaneously molded with and joined to a bottom wall by integral flexible plastic hinges so that the side walls can be raised up into right angular relationship with the bottom wall. The simultaneous blow molding of the walls of the compartment in flat condition with the bottom wall permits the integral formation of drawer supporting ribs extending inwardly from the side walls and also permits the formation of a compartment having a greater depth than has been possible in known types of unitary one-piece blow-molded containers. Support ledges are integrally formed on the interior walls and adjacent the living hinges so that the side and rear walls are rigidly supported on the support ledges when the rear and side walls are raised up into right angular relationship with the bottom wall. The living hinges are not required to support any weight or force applied to the side and rear walls but merely act to maintain the side and rear walls in alignment above the peripheral edge portions of the bottom wall.

21 Claims, 19 Drawing Figures





US006331054B1

(12) **United States Patent**  
Seu et al.

(10) Patent No.: **US 6,331,054 B1**  
(45) Date of Patent: **Dec. 18, 2001**

(54) **UNITARY ONE-PIECE BODY STRUCTURE FOR INK-JET CARTRIDGE**

(75) Inventors: Preston Seu, Vancouver, WA (US);  
Patrick Boyd; Gary Powell, both of  
Albany, OR (US)

(73) Assignee: **Hewlett-Packard Company, Palo Alto, CA (US)**

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/664,625**

(22) Filed: **Sep. 19, 2000**

**Related U.S. Application Data**

(62) Division of application No. 09/516,922, filed on Mar. 2, 2000, now Pat. No. 6,260,961.

(51) Int. Cl.<sup>7</sup> **B41J 2/175**

(52) U.S. Cl. **347/87; 347/86**

(58) Field of Search **347/86, 87; 425/548; 264/239, 250, 251, 245, 249**

(56) **References Cited**

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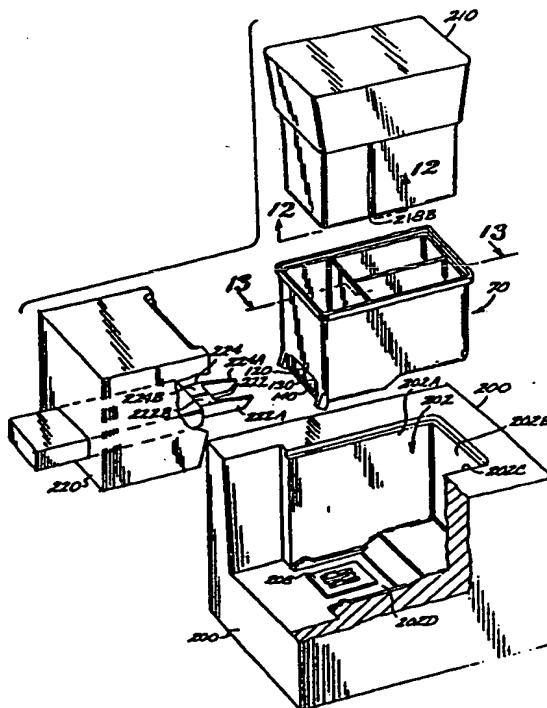
\* cited by examiner

**Primary Examiner**—Anh T. N. Vo

(57) **ABSTRACT**

A multi-compartment ink-jet cartridge body structure, which includes a unitary body having a plurality of ink reservoir compartments. Each compartment includes an outlet port through which ink passes to feed the ink to an ink-jet printhead nozzle array. The body further includes a printhead nozzle array mounting region, and an ink manifold structure including a plurality of corresponding ink channels each leading from a corresponding outlet port to a feed opening formed at the printhead mounting region. The body and manifold structure are formed as a unitary one-piece structure. A lid is attached to the unitary body to cover the compartments. The body includes an external wall, and an access opening is formed in the wall adjacent the manifold structure. A seal structure attached to the body for sealing the access opening. The body structure can be fabricated by a plastic material using an injection molding process. The access opening is a mold slide insert opening in the nose-piece area, and the seal structure seals the slide insert opening. The molding process can be carried out by a three piece mold set to fabricate the body.

**9 Claims, 6 Drawing Sheets**





US005285732A

## United States Patent [19]

Gottlieb

[11] Patent Number: 5,285,732

[45] Date of Patent: Feb. 15, 1994

## [54] PALLET OF UNITARY CONSTRUCTION

[75] Inventor: Norman J. Gottlieb, Thornhill,  
Canada[73] Assignee: Container Corporation International  
Ltd., Bridgetown, Barbados

[21] Appl. No.: 977,977

[22] Filed: Nov. 18, 1992

[51] Int. Cl.<sup>5</sup> ..... B65D 19/00

[52] U.S. Cl. ..... 108/51.3; 108/51.1

[58] Field of Search ..... 108/51.3, 51.1, 56.1

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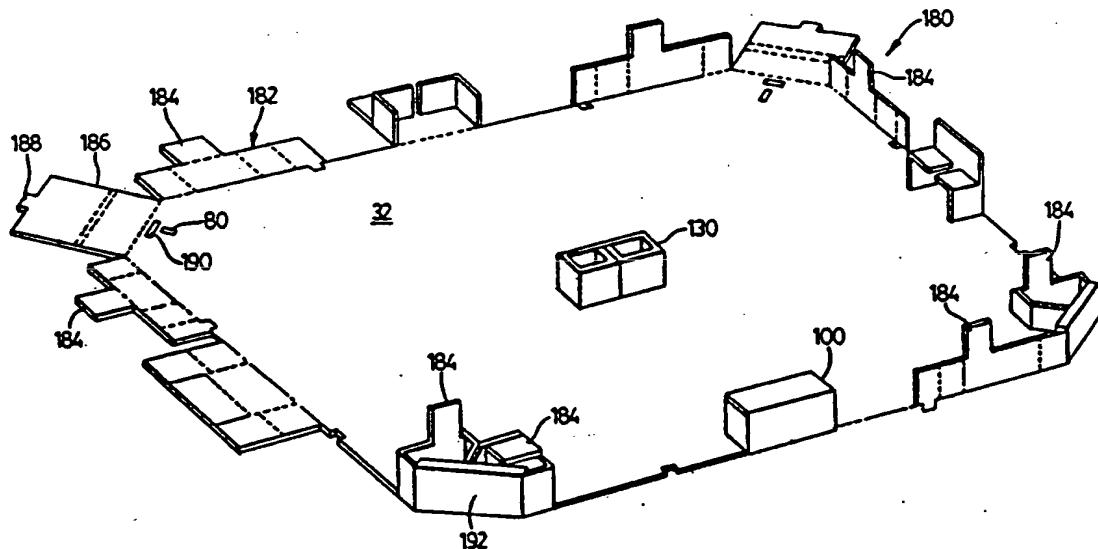
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1311981 11/1962 France .  
457272 7/1968 Switzerland .  
955035 4/1964 United Kingdom .

Primary Examiner—Kenneth J. Dorner  
Assistant Examiner—Gerald A. Anderson  
Attorney, Agent, or Firm—Shlesinger, Arkwright & Garvey

## [57] ABSTRACT

There is disclosed a lightweight pallet base of unitary, one piece construction fabricated of a stiff foldable sheet material such as corrugated cardboard. In one aspect the pallet comprises a central platform having foldable corner and side flaps attached to the central platform. The corner flaps and a portion of the side edge flaps adjacent the corners are folded and interlocked to form corner support members. The central portion of the side edge support members are folded to form side edge supports located midway between the corners of the platform. The support members are of one piece construction with the central platform with the pallet being assembled from a die cut blank. Different embodiments of the unitary pallet use the foldable side edge flaps located adjacent the corner flaps in different ways to reinforce the corner support members. In another aspect a load bearing pallet tray is secured to the unitary pallet base which provides a combination having improved beam strength.

30 Claims, 12 Drawing Sheets



## United States Patent [19]

Shea

[11] Patent Number: 5,012,614

[45] Date of Patent: May 7, 1991

## [54] BLOW-MOLDED UNITARY THERMOPLASTIC THRESHOLD

[76] Inventor: Gregory T. Shea, 8797 Birgham Ct., Dublin, Ohio 43017

[21] Appl. No.: 440,498

[22] Filed: Nov. 22, 1989

[51] Int. CL<sup>5</sup> ..... E06B 1/70

[52] U.S. Cl. ..... 49/468; 49/471

[58] Field of Search ..... 49/468, 467, 409, 471, 49/470

## [56] References Cited

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Primary Examiner—Philip C. Kannan

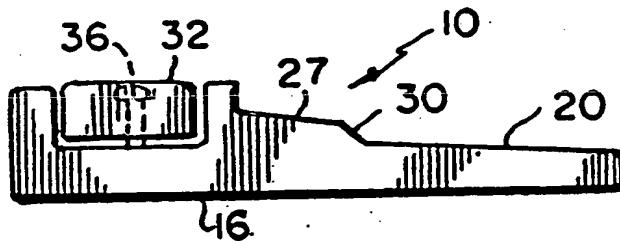
Attorney, Agent, or Firm—Michael L. Keller

## [57] ABSTRACT

The present invention is addressed to a thermoplastic threshold of unique configuration and which is manufactured by blow molding techniques. The novel thermoplastic threshold is hollow and sealed to the outside.

It is of one-piece construction made by blow molding a parison of thermoplastic material. The threshold has a bottom adapted to rest on a lower horizontal jamb and has stiffener ribs disposed at the bottom. A planar tread segment is disposed to the outside. A transverse, U-shaped channel has upstanding vertical walls and is adapted to receive a sill. The bottom of the channel has apertures for receiving threaded elongate members (e.g. screws) for adjusting the height of a sill that can be disposed within the channel. The outside disposed vertical channel wall is joined about its top to an outer, sloping wall or transition wall that meets the tread segment. At predetermined locations, the bottom of the threshold is recessed upwardly to engage the bottom of the outside vertical channel wall and the sloping wall at its meeting with said tread segment. These bottom recesses have upwardly projecting side weirs disposed from the inner vertical wall to said sloping wall/tread segment meeting. There is a hole in the vertical wall at its bottom and in said sloping wall at its meeting with said tread segment for water to flow from within the channel through said holes and onto said tread segment (e.g., a weep system). The bottom or top adjacent such sealed threshold end contains a channel parallel to each end and adapted to present, with each said end, at least two walls for said threshold to be attached to vertical side jambs for its installation.

14 Claims, 3 Drawing Sheets



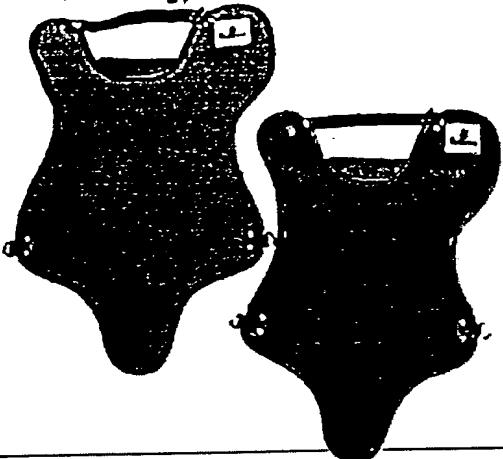
09/525,526

## **APPENDIX E**

### **Web Pages Equating “Unitary” Construction with “One-piece” Construction**

[ [nokona.com](http://nokona.com) ]• • • American Made for American P  
More than two centuries of experience in "getting"[Baseball](#) [Softball](#) [Football](#) [Dealers](#) [History](#) [Contact Us](#)Nokona's NEW: [Glove Club](#) [Request a 2002](#)

## Body Protectors



Nocona's Body Protectors are lightweight and allow freedom of movement. Assuring maximum protection against hard blows the pads are constructed in one-piece, of molded, unitary construction. Unicellular polyethylene foam, which provides excellent impact attenuating effectiveness, is utilized in the molding. To aid in durability and long wear, foam material used is impervious to moisture.

**Nokona Body Protectors Have:**

- Nylon Stitching • Extruded Vinyl-dipped neck rolls • Harnesses that are adjustable and replaceable • Three or more panel construction. • Top Grain leather attachment tabs.

**Women/Girls Body Protectors****WLMR Girls Extra Large Short Style**

Double flex construction. Nylon covered. Vinyl binding. Soft vinyl dipped neck pad. Adjustable and replaceable harness. Extra padding and plastic inserts over breast area.

**GLMR Girls Large Short Style**

Double flex construction. Blue nylon covered. Vinyl binding. Soft vinyl dipped neck pad. Adjustable and replaceable harness. Extra padding and plastic inserts over breast area.

**GSMR Girls Small Short Style**

Nylon covered. Vinyl binding. Soft vinyl dipped neck pad. Adjustable and replaceable harness. Extra padding and plastic inserts over breast area.

**Men Body Protectors****CPMR-L Collegiate Professional**

Extra Large Style. Triple-flex construction. Nylon covered front and back. Heavy-duty adjustable harness. Vinyl binding and soft-dipped neck pad. Extended shoulder design.

**CPMR Collegiate/Pro Short Style**

Triple-Flex construction. Nylon covered front and back. Heavy-duty adjustable harness. Vinyl binding and soft-dipped neck pad. Extended shoulder design.

**HSMR High School Short Style**

Double flex construction. Nylon covered front and back. Heavy duty adjustable harness. Vinyl binding and soft dipped neck pad. Extended shoulder design.

**PLMR Senior Little League Style**

Extended crotch and shoulder design. Double flex construction. Nylon covered. Adjustable and replaceable harness. Soft vinyl dipped neck pad. Vinyl binding.

**XLMR** Same as PLMR, only larger.

**LLMR Little League**

Extended crotch and shoulder design. Soft vinyl-dipped neck pad. Double flex construction. Nylon covered. Adjustable and replaceable harness.

**BSMR Little League Style**

Small Size. Extended crotch and shoulder. Double flex construction. Soft vinyl-dipped neck pad. Adjustable and replaceable harness. Nylon covered.

**SSMR Short Style Boys**

Double flex construction. Nylon covered. Soft vinyl dipped neck pad. Vinyl binding. Adjustable and replaceable harness.

**SLMR High School**

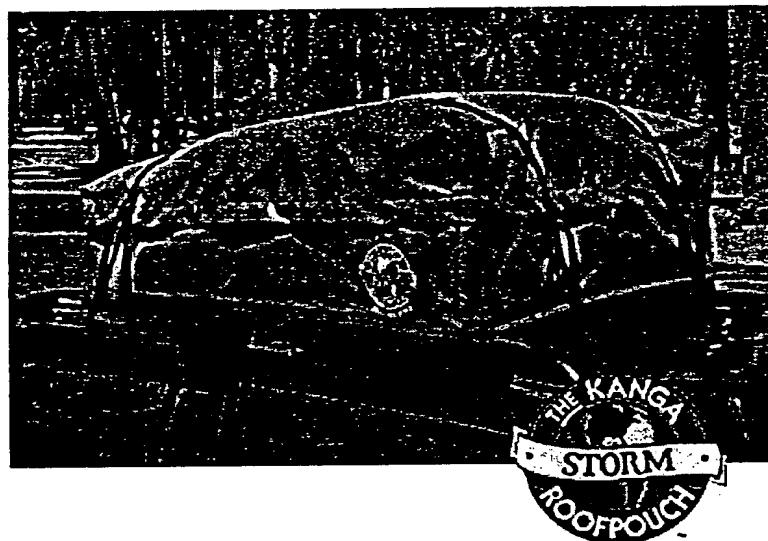
Same as XLMR only three inches longer, with tails.

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The New & Economical  
**Storm**  
**Kanga RoofPouch®**



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**Dimensions**

15 cubic foot: 47" L X 38" W X 9" / 18" H

11 cubic foot: 39" L X 35" W X 8" / 15" H

8 cubic foot: 26" L X 35" W X 16" H

Available only in Charcoal Grey

**NOTE:** This product is primarily designed to attach to vehicles with roof racks - either factory or after-market.

**The Storm RoofPouch has the following features:**

- ° Made of 19 oz. heavy-duty double-coated vinyl material (same material as used for "dry bags", tackling dummies and truck tarp)
- ° Unique unitary construction (made from one piece of material) limits number of seams
- ° Corners are double-folded/double-stitched for strength and weatherproofness
- ° Connector straps RF-welded (using radio frequency), eliminating needle holes in the top of the RoofPouch
- ° Slip-resistant, heavy-duty, water-repellent-treated, double-slide YKK zippers
- ° Connector straps swivel to allow attachment to either front/rear crossbars or side bars.
- ° Aerodynamic wedge-shape conserves gas and provides a quiet ride
- ° Unaffected by temperatures between -65°F and +180°F
- ° **Folds into less than 1 cu. ft. of space when not in use!**

The **Storm** RoofPouch®, newly introduced into the Kanga line of car-top luggage carriers, is destined to become our most popular model. Priced more economically than our other RoofPouches, the **Storm** still boasts the high quality/heavy-duty 19 oz. waterproof vinyl material, aerodynamic design, metal hardware, connector straps which are welded on, slip-resistant zippers and a zipper tab lock. Couple that with a very readable owner's manual and a full one-year warranty, and the **Storm** beats the competition hands down! This RoofPouch is predominantly designed for use with roof racks - either factory or after-market.

The 8 cu. ft. model was specifically designed to fit today's smaller, aero-dynamic roof racks.

## Backpacks For Your Car

Other models: [Hurricane](#) | [Limited Edition](#) | [Cyclone](#) | [Pickup Pouch](#) | [Options](#)  
[Parts](#)

*Have questions or want to place an order, call (800) 347-9793*

09/525,526

## APPENDIX F

**Dictionary pages regarding “Unitary” and “Unit”**

THE  
AMERICAN  
HERITAGE  
COLLEGE  
DICTIONARY

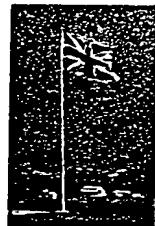
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THIRD EDITION

on·ar·y



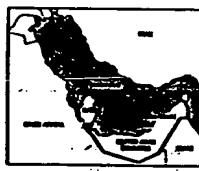
HOUGHTON MIFFLIN COMPANY  
*Boston • New York*



Union Jack



unitard



United Arab Emirates

union. 3. **Unionist.** One loyal to the fed... *etc.* during the Civil War. — **un·ion·is·tic** *adj.*

**un·ion·ize** (yōōn'yo-niz') *v.* -ized, -iz·ing, -iz·es. — *tr.* 1. To organize into a labor union. 2. To cause to join a labor union. — *intr.* To organize or join a labor union. — **un·ion·i·za·tion** (-yōōn-i-zā'shən) *n.* — **un·ion·i·za·tōr** *n.*

**union Jack** *n.* 1. A flag consisting entirely of a union. 2. **Union Jack.** The flag of the United Kingdom.

**union label** *n.* An identifying mark attached to a product indicating it has been produced by members of a trade union.

**Union of So·vi·et Socialist Republics** (sō'vē-ēt', -it, sōv'ēt', sō'vē-ēt'). Commonly called Soviet Union or Russiā (rūsh'ē). A former country of E Europe and N Asia with coastlines on the Baltic and Black seas and the Arctic and Pacific oceans; estab. in Dec. 1922. In Dec. 1991 it was officially dissolved into a number of independent republics.

**union shop** *n.* A business or industrial establishment whose employees are required either to be union members or to join the union within a specified time after being hired.

**union suit** *n.* A one-piece undergarment combining shirt and long pants.

**u·ni·p·a·rous** (yōō-nip'ə-rəs) *adj.* 1. Producing only one egg or offspring at a time. 2. *Bot.* Forming a single axis at each branching, as certain flower clusters.

**u·ni·per·son·al** (yōō-ni-pär'sə-nəl) *adj.* Manifested as or existent in the form of only one person: *unipersonal spirit*.

**u·ni·po·lar** (yōō-ni-pōl'ər) *adj.* 1. Having, acting by means of, or produced by a single magnetic or electric pole. 2. *Biol.* Having a single fibrous process. Used of a neuron. — **u·ni·po·lar·i·ty** (-pō-lär'i-tē, -pōr') *n.*

**u·ni·po·tent** (yōō-nip'ə-tənt) *adj.* Capable of developing into only one type of cell or tissue.

**u·ni·que** (yōō-nēk') *adj.* 1. Being the only one of its kind. 2. Without an equal or equivalent; unparalleled. 3. *a.* Characteristic of a particular category, condition, or locality: *a problem unique to coastal areas.* *b.* *Informal.* Unusual; extraordinary. [Fr. < OFr. < Lat. *únicus*. See *ol-no-*.] — **u·ni·que·ness** *n.*

**Usage Note:** In the most recent survey the sentence *Her designs are quite unique in today's fashion scene* was unacceptable to 80 percent of the Usage Panel. Critical objections to the comparison and degree modification of absolute terms such as *unique* date to the 18th century and have been applied to a wide group of adjectives, including *equal*, *fatal*, *omnipotent*, *parallel*, *perfect*, and *unanimous*. According to the standard argument, such words denote properties that a thing either does or does not have but cannot have to a qualifiable degree. Thus if *unique* is properly used to mean "without equal or equivalent," something either is unique or it isn't, and phrases such as *very unique* and *more unique* can only betray a weakening of the sense to mean something like "unusual" or "distinctive." A reputable writer, however, might say that a painting is unique and mean that it is worthy of inclusion in a class by itself according to certain implicit but generally accepted criteria. Thus a legitimately unique painting might be one that realizes an unparalleled aesthetic vision but not one that is rendered only in pigments whose names begin with the letter *o*. Given this understanding, it is not inherently impossible to think of uniqueness as a matter of degree, in the sense that one painting may be more or less worthy of inclusion in a class by itself than some other. • What is troubling about the use of *unique* by copywriters, for example, is that in such writing uniqueness is claimed for a restaurant in virtue of some trivial properties of its decor or menu, for example. Though it may be true that such properties render a restaurant *logically unique*, they do not constitute legitimate grounds for putting it into a class by itself according to the criteria ordinarily invoked when things are sorted into classes. But it is not surprising that *unique* should lend itself to promiscuous modification and comparison; for once it is granted that uniqueness can be claimed for any product or service that is somehow distinctive from all its competitors, it is inevitable that an increase in uniqueness will be seen in every minor innovation. See *Usage Note at infinite*.

**u·ni·sex** (yōō-ni-sĕks') *adj.* 1. Designed for or suitable to both sexes: *unisex clothing*. 2. Not distinguished or distinguishable on the basis of sex: *unisex look*. — *n.* Elimination or absence of sexual distinctions, esp. in dress.

**u·ni·sex·u·al** (yōō-ni-sĕks'ü-əl) *adj.* 1. Of or relating to only one sex. 2. Having only one type of sexual organ; not a hermaphrodite. 3. *Bot.* Having either stamens or pistils but not both. 4. *Unisex.* — **u·ni·sex·u·al·i·ty** (-ül'ë-tē) *n.* — **u·ni·sex·u·al·i·ty** *adv.*

**u·ni·son** (yōō-ni-sən, -zən) *n.* 1. *Mus.* *a.* Identity of pitch; the interval of a perfect prime. *b.* The combination of parts at the same pitch or in octaves. 2. The act or an instance of speaking the same words simultaneously by two or more speakers. 3. An instance of agreement; concord. — *adj.* In unison. 1. In complete agreement; harmonizing exactly. 2. At the same time; at once. [ME < OFr. < Med.Lat. *unisonus*, in unison < LLat., monotonous: Lat. *uni-* + Lat. *sonus*, sound; see *swen-*.]

**u·nit** (yōō'nit) *n.* 1. An individual, a group, a structure, or other entity regarded as an elementary constituent of a whole. 2. A group regarded as a distinct entity within a larger group. 3. *a.* A mechanical part or module. *b.* An entire apparatus or the equipment that performs a specific function. 4. A precise quantity in terms of which the magnitudes of other quantities of the same kind can be stated. 5. *Medic.* The quantity of a drug or other agent necessary to produce a specific effect. 6. *a.* A fixed amount of scholastic study used in calculating academic credits, usu. measured in hours of formal instruction or laboratory work. *b.* A section of an academic course focusing on a selected theme: *a unit on Native Americans*. 7. The number immediately to the left of the decimal point in the Arabic numeral system. 8. *Math.* The lowest positive whole number. [Back-formation < *UNITY*.]

**Unit** *abbr.* 1. Unitarian. 2. Unitarianism.

**u·ni·tard** (yōō'ni-tārd') *n.* A one-piece tight-fitting leotard and tights combination, sometimes with foot straps. [UNI- (LEO) + TARD.]

**u·ni·tar·i·an** (yōō'ni-tār'ē-ən) *n.* 1. An adherent of Unitarian Universalism. 2. A monotheist who is not a Christian. 3. A Christian who is not a Trinitarian. [ < NLat. *unitarius*, monotheist < Lat. *unitas*, unity. See *unite*.] — **u·ni·tar·i·an** *adj.* — **U·ni·tar·i·an·ism** *n.*

**Unitarian Universalism** *n.* A religious association of Christian origin that has no official creed and that considers God universal, salvation universal, and reason and conscience the criteria for belief and practice. — *Unitarian Universalist* *adj.* & *n.*

**u·ni·tar·i·ty** (yōō'ni-tār'ē-tē) *adj.* 1. Of or relating to a unit.

2. Having the nature of a unit; whole. 3. Based on or characterized by one or more units. — **u·ni·tar·i·ty** *adv.*

**unit character-a-Genet** *n.* A character inherited in accordance with Mendel's law of segregation.

**unit cost** *n.* The cost of a given unit of a product.

**u·ni·te** (yōō-nēt') *v.* **u·ni·tēd**, **u·ni·tēing**, **u·ni·tētes**. — *tr.* 1. To bring together so as to form a whole. 2. To combine (people) in interest, attitude, or action. 3. To join (a couple) in marriage. 4. To cause to adhere. 5. To have or demonstrate in combination: *She unites common sense with vision*. — *intr.* 1. To become or seem to become joined, formed, or combined into a unit. 2. To join and act together in a common purpose or endeavor. See *Syns at join*. 3. To be or become bound together by adhesion. [ME *unite* < Lat. *únire*, *unit-* < *únus*, one. See *ol-no-*.]

**u·ni·tēd** (yōō-nēt'ēd) *adj.* 1. Combined into a single entity. 2. Concerned with or resulting from mutual action. 3. Being in harmony; agreed. — **u·ni·tēd·i·ty** *adv.* — **u·ni·tēd·i·ness** *n.*

**U·ni·tēd Ar·ab E·mir·a·tes** (yōō-ni-tēd ăr'ăb īmīr'ētēz, īmīr'ēz). Formerly Tru·cial O·man (trōō'shăl ō-mān') A country of E Arabia, a federation of seven sheikdoms on the Persian Gulf and the Gulf of Oman; formed in 1971. Cap. Abu Dhabi. Pop. 980,000.

**United Arab Republic** 1. A former union of Egypt and Syria from 1958 to 1961. Yemen joined the union in 1958, thus creating the United Arab States. 2. See *Egypt*.

**United Kingdom** or **United Kingdom of Great Brit·ain and Northern Ire·land** (brēt'ēn; ir'länd). Commonly called Great Britain or Britain. A country of W Europe comprising England, Scotland, Wales, and Northern Ireland. Beginning with the kingdom of England, it was created by three acts of union: with Wales (1536), Scotland (1707), and Northern Ireland (1801). Cap. London. Pop. 55,648,992.

**United Nations** An international organization founded in 1945 to promote peace and economic development.

**United States** or **United States of A·mer·i·ca** (ämēr'ē-kā). A country of central and NW North America with coastlines on the Atlantic and Pacific oceans. It includes the noncontiguous states of AK and HI and various island territories in the Caribbean Sea and Pacific Ocean. Cap. Washington DC. Pop. 249,632,692.

**u·ni·tive** (yōō-ni-tiv, yōō-ni-tiv') *adj.* Serving to unite.

**u·ni·tē·zē** (yōō-ni-tēz') *tr.v.* -ized, -iz·ing, -iz·es. 1. To separate, classify, or package in discrete units. 2. To make into a single unit. — **u·ni·tē·zē·tion** (yōō-ni-tē-zā'shən) *n.*

**unit pric·ing** (pri'sing) *n.* The pricing of goods on the basis of cost per unit of measure.

**unit rule** *n.* A rule holding that a state's entire vote must go to the candidate preferred by the majority of that state's delegates in a Democratic Party national convention.

**u·ni·ty** (yōō-ni-tē) *n., pl.* -ties. 1. The state or quality of being one; singleness. 2. The state or quality of being in accord; harmony. 3. *a.* The combination or arrangement of parts into a whole; unification. *b.* A combination or union thus formed.

4. Singleness or constancy of purpose or action; continuity. 5. *a.* An ordering of all elements in a work of art or literature so that each contributes to a unified aesthetic effect. *b.* The effect thus produced. 6. One of the three principles of dramatic structure derived by French neoclassicists from Aristotle's *Poetics*, stating that a drama should have but one plot, which should take place in a single day and be confined to a single locale. 7. *Math.* *a.* The number 1. *b.* See *Identity el-*

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# United States Patent [19]

Roper

[11] 3,780,899  
[45] Dec. 25, 1973

[54] CONTAINER WITH CONCAVE BELT AND LOCK SEAM  
[75] Inventor: Ralph E. Roper, Indianapolis, Ind.  
[73] Assignee: Wallace Expanding Machines, Inc., Indianapolis, Ind.  
[22] Filed: Nov. 1, 1971  
[21] Appl. No.: 195,583

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Primary Examiner—George E. Lowrance  
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## Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 101,792, Dec. 28, 1970, abandoned.  
[52] U.S. Cl..... 220/5 R  
[51] Int. Cl..... B65d 7/02  
[58] Field of Search..... 220/5 R, 67, 72;  
292/256.65

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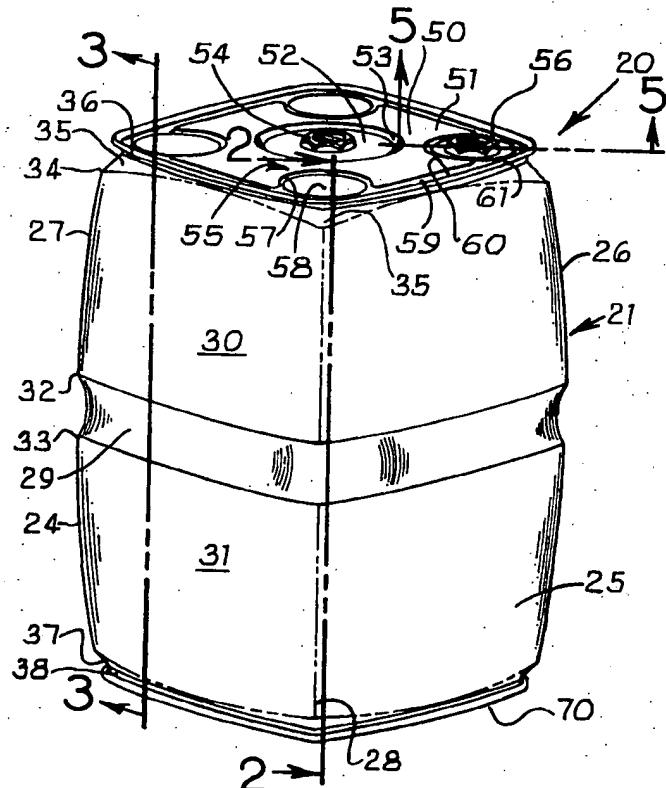
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## ABSTRACT

A container having a rectangular tubular body section sealingly joined to a top and bottom panel by curled lock seams. The tubular body has an upper and lower portion integrally joined together by a center concave smooth and rounded belt. The top and bottom panels are secured to the tubular body by means of curled lock seams. The containers are adapted to stack one upon another by means of the complementary configuration of the top and bottom panels. A V-shaped recess is located immediately adjacent each lock seam extending around the periphery of the top and bottom panels adding to the strength of the container.

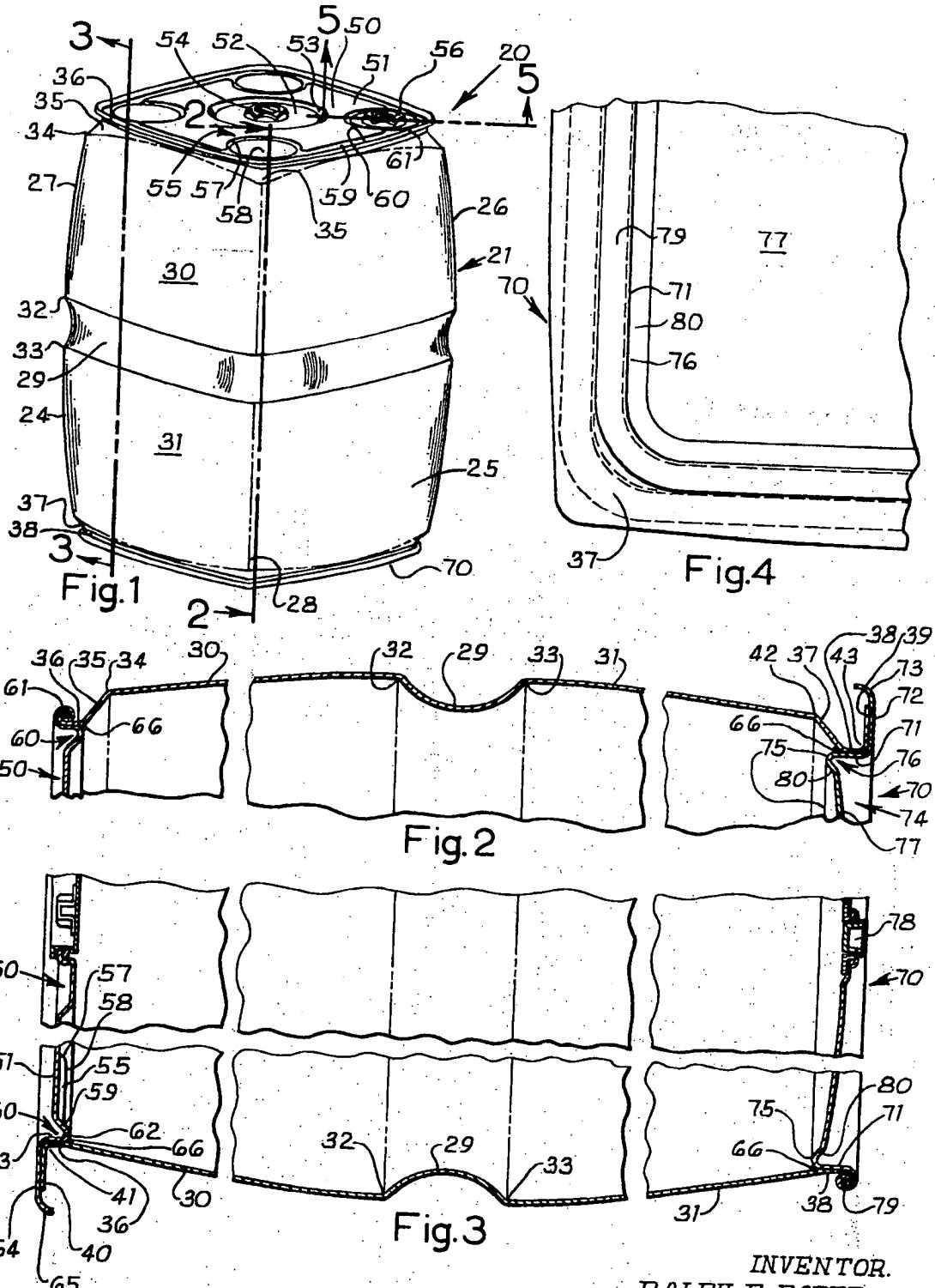
11 Claims, 11 Drawing Figures



PATENTED DEC 25 1973

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SHEET 1 OF 4

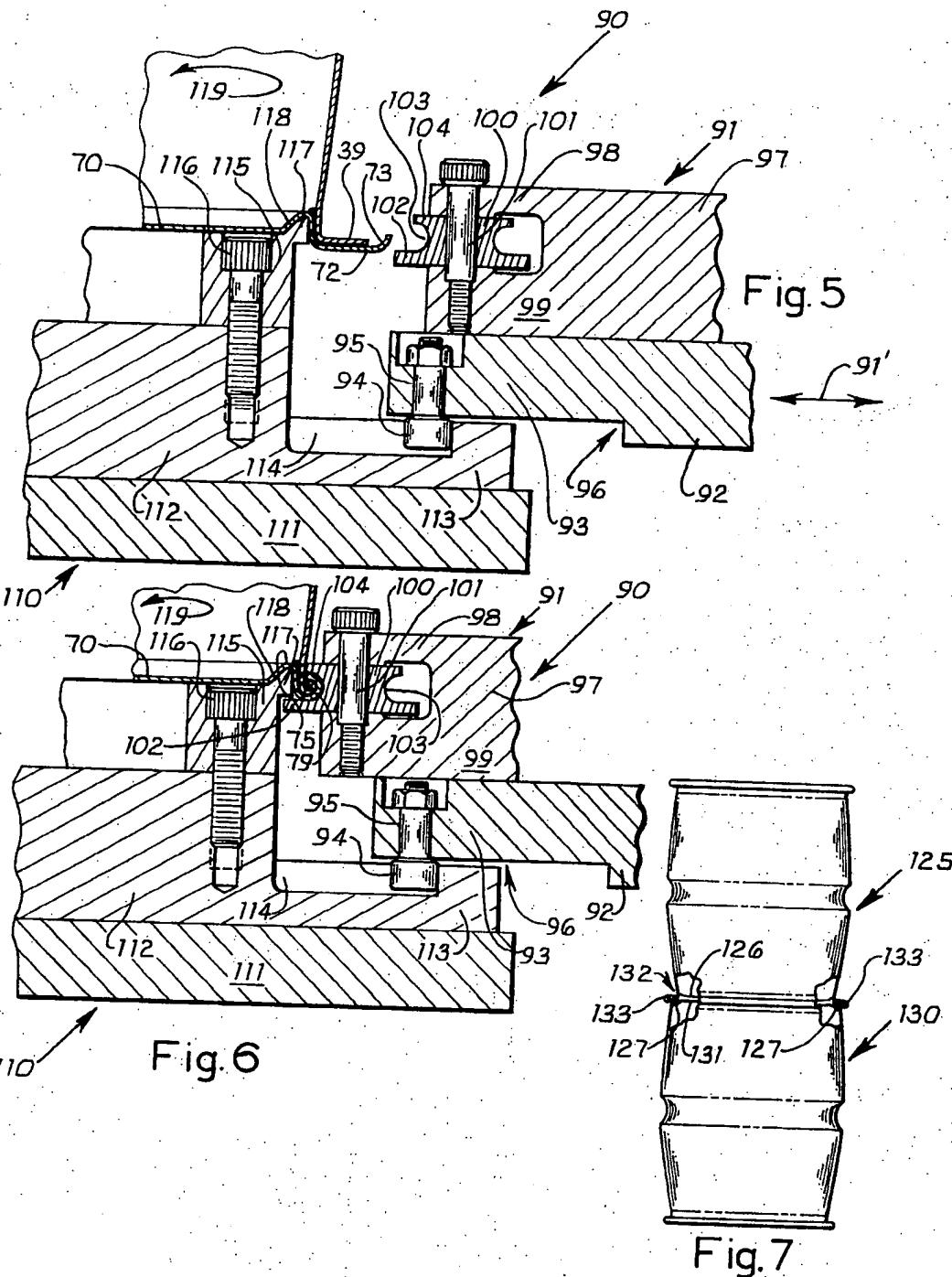


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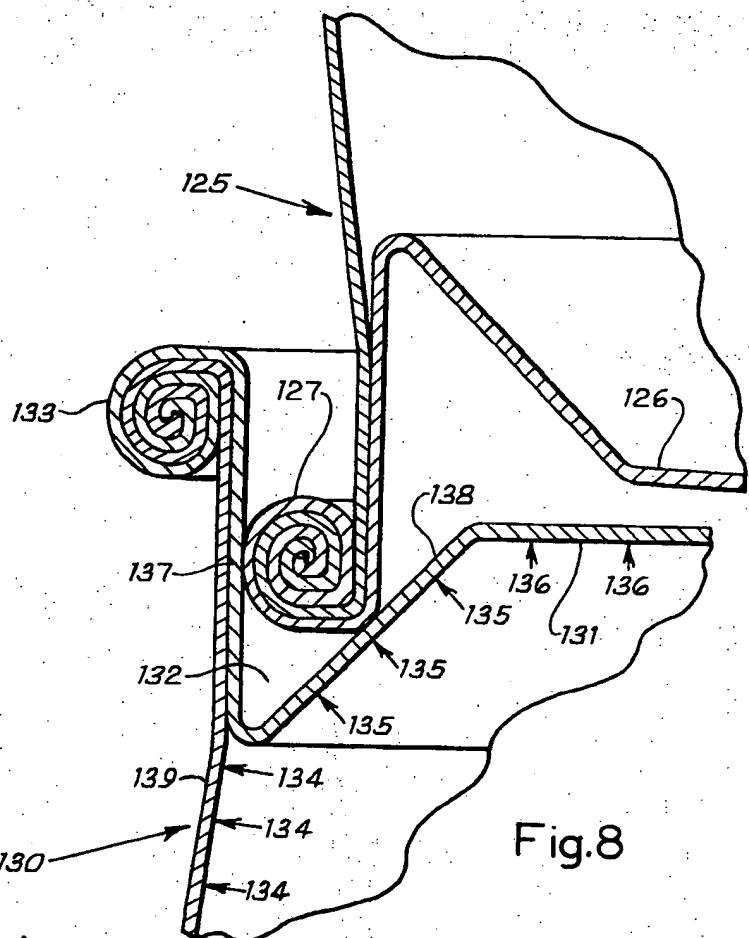


Fig. 8

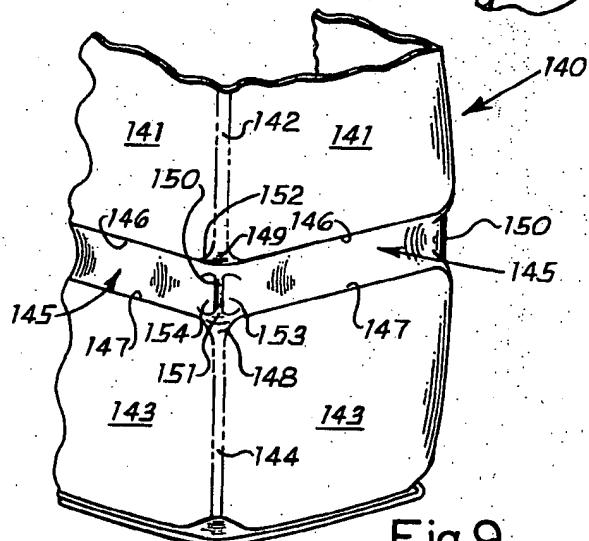


Fig. 9

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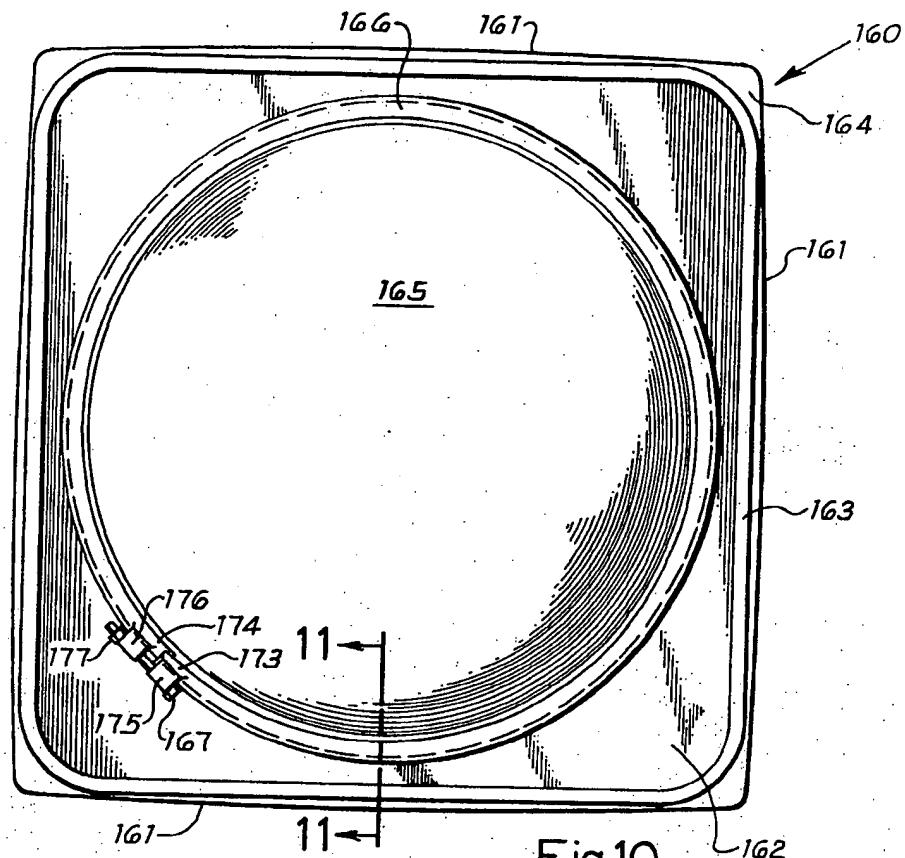


Fig.10

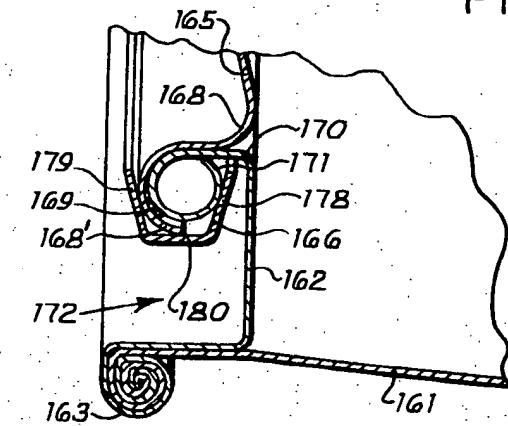


Fig.11

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## CONTAINER WITH CONCAVE BELT AND LOCK SEAM

### CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my co-pending U.S. Patent application Ser. No. 101,792, filed Dec. 28, 1970, and entitled "Container with Concave Belt and Lock Seam", now abandoned.

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention is in the field of containers.

#### 2. Description of the Prior Art

Liquid commodities are frequently shipped and stored in circular drums. In my U.S. Pat. No. 3,586,204 entitled "Container and Method of Making Same", which issued on June 22, 1971, a container is described having a rectangular cross section which is adapted to make maximum utilization of warehouse space. Other prior art containers and walls which are provided with recesses are shown in the following U.S. Patents: 867,940 issued to Bell; 1,807,912 issued to Hansson; and 3,102,502 issued to Seeloff. These recesses are either not continuous or are not smoothly contoured and as a result, do not provide the degree of strength exhibited by the container disclosed herein. The container disclosed herein likewise has a rectangular cross section and also is designed to withstand greater internal container pressures. The U.S. Department of Transportation has established various specifications for shipping containers as detailed in Tariff No. 23 issued Aug. 3, 1969, by T.C. George, 2 Penn Plaza, New York, N.Y. 10001. These specifications include hydrostatic pressure and leakage tests. The container disclosed herein is designed to pass these tests and has a smooth concave belt integrally joined to the smooth container walls. The normal gusseting and embossing of the container, which produce localized stress tear points, is not required as a result of the shape of the container and center belt.

The end panels are joined to the main body of the container by a curled lock seam which is produced by rolling the outwardly disposed flanges of the end panels and the main container body in curled fashion producing a solid metal lock seam. Prior art devices disclosing lock seams are shown in the following U.S. Patents: 3,251,515 issued to Henchert; 3,272,671 issued to Gaylord; and 3,425,381 issued to Wessely. The container disclosed herein has V-shaped recesses adjacent to the lock seams in each end panel which extend around the periphery of the panels providing for greater strength. The bottom panel is complementary in configuration and size relative to the top panel for stacking purposes.

### SUMMARY OF THE INVENTION

One embodiment of this invention comprises a rectangular tubular body having side walls with rounded corners joining the side walls together. The body also has a smooth continuous concave belt extending around the body with an upper and lower rounded terminus extending laterally. The side walls have an upper wall portion and a lower wall portion integrally joined to and separated by the belt. A top panel is sealingly mounted atop the body.

Another embodiment of this invention comprises a rectangular tubular body having a first inverted L-

shaped top edge portion. The embodiment further comprises a top lid having a first generally horizontal wall with a second horizontal wall extending completely around the first horizontal wall and being integrally joined thereto by a first V-shaped wall. The V-shaped wall fits within the first portion.

Objects of this invention are to provide an improved container, to provide a container which is easily and conveniently stacked and moved from place to place,

10 to provide a container which is stronger than existing containers and which has a concave center strengthening belt without requiring various gussets, to provide a container having top and bottom panels secured to a main container body by tightly compacted curled and solid lock seams, to provide a container having top and bottom panels with V-shaped strengthening recesses adjacent the lock seams, to provide such a container also having a removable top, to provide a container with a concave strengthening belt with vertical columns, as well as other objects which will become apparent as the description proceeds.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a container incorporating the present invention.

FIG. 2 is an enlarged fragmentary view taken through one of the corners of the container of FIG. 1 along the line 2-2 and viewed in the direction of the arrows.

FIG. 3 is an enlarged fragmentary view taken through one of the sides of the container of FIG. 1 along the line 3-3 and viewed in the direction of the arrow.

FIG. 4 is a fragmentary bottom elevation of the container of FIG. 1.

FIG. 5 is a fragmentary sectional view illustrating the tool for joining the top and bottom panels to the container.

FIG. 6 is the same view as FIG. 5 only showing a panel being joined to the container.

FIG. 7 is a reduced side elevation of two of the containers of FIG. 1 in a stacked condition.

FIG. 8 is an enlarged fragmentary view of a portion of the stacked containers shown in FIG. 7.

FIG. 9 is a fragmentary perspective view of another embodiment of a container incorporating the present invention.

FIG. 10 is a top view of a container with a removable top incorporating the present invention.

FIG. 11 is a fragmentary cross sectional view taken along the line 11-11 of FIG. 10 and viewed in the direction of the arrows.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, there is illustrated a container 20 which is formed from a rectangular tubular body 21 and a top panel 50 opposing a bottom panel 70. The tubular body 21 includes four identical side walls 24, 25, 26 and 27 which are smoothly connected by rounded corners 28 so as to form a container shape of generally rectangular cross section. Each side wall includes a raised main body section having an upper portion 30 and a lower portion 31 integrally joined together by a concave belt 29. Upper portion 30 is joined to concave belt 29 at junction 32 whereas lower portion 31 is joined to concave belt 29 at junction 33. Belt 29 extends completely around the periphery of tubular body 21.

FIGS. 2 and 3 are fragmentary cross sectional views of the container of FIG. 1 respectively illustrating a corner section and a side section. Referring now to FIG. 2, belt 29 is rounded smoothly inward. Upper portion 30 is convex as viewed exteriorly of the container with the most outward point being located at rounded junction 32 and tapering smoothly inward wherein it is integrally joined to angular wall 35 at location 34. Angular wall 35 exists only at the four corners of the tubular body and is blended into upper portion 30 so as to be nonexistent at the side of the container. Upper portion 30 is tapered inward being integrally joined to a vertical wall 36 (FIG. 3) at each side of the container. Angular wall 35 is likewise integrally joined to vertical wall 36. Flange 40 (FIG. 3) is integrally joined to vertical wall 36 being disposed at right angles therefrom and extending completely around tubular body 21. Thus, walls 36 and 40 form an inverted L-shaped configuration 41 extending around the top periphery of tubular body 21. This L-shaped configuration is not shown in FIG. 2 since the top panel 50 has been sealed to the tubular body producing a lock seam 61 which will be described later in this specification.

Lower portion 31 is shaped identically to upper portion 30 having a most outward portion at rounded junction 33 and tapering inwardly being integrally joined to angular corner wall 37 at 42. Wall 37 is integrally joined to vertical wall 38 having flange 39 integrally joined thereto at right angles. Walls 38 of flange 39 form an L-shaped configuration which extends completely around the bottom periphery of tubular body 21. Angular wall 37 exists only on the four corners of the tubular member and lower portion 31 is integrally joined directly to vertical wall 38 on the sides of the container. FIG. 3 does not show the L-shaped configuration 43 since bottom panel 70 is shown as attached to the tubular body by lock seam 79 to be described later in this specification.

FIG. 4 is a bottom elevation of the container of FIG. 1 particularly illustrating bottom panel 70. The bottom panel closes the lower end of tubular body 21 and is attached thereto by means of lock seam 79. FIG. 2 shows the bottom panel adjacent to the tubular body 21 prior to curling of the edges of the bottom panel and the tubular member. At the edge of bottom panel 70 there is initially a horizontal flange 72 integrally joined at right angles to vertical wall 71. The tip of horizontal flange 72 is turned upward forming vertical end portion 73. Portion 73 and flange 72 extend completely around the outer periphery of bottom panel 70. Vertical wall 71 is parallel to the vertical axis of tubular body 21 and extends upward beyond the main wall 77 of the bottom panel forming an inverted V-shape 76 and ridge 75 which extends around the bottom panel. The main wall 77 of the bottom panel is recessed at 74 sloping downward from ridge 75 to the center of the bottom panel having removable plug 78 located for drainage of the container. The downward sloping wall 77 is integrally joined to ridge 75 by a steeper sloping angular wall 80.

The top panel 50 is configured similarly to the bottom panel and is joined to the tubular body 21 by means of a lock seam 61. Top panel 50 (FIG. 1) has an upraised portion 51 with the center thereof being depressed 52 receiving a removable plug 54. A steep angular wall 53 extending around the center depressed area 52 integrally joins the center section to upraised portion 51. A depressed bung area is located at each of

the four corners of the top panel each having a recessed wall 58 joined to upraised wall 51 by an angular wall 57. Top cover 50 has a bung area 55 in each corner in order to facilitate installation of a conventional removable plug. FIG. 1 shows a removable plug 56 being located in one of the four corners; however, it is understood that additional plugs may be installed in the other three remaining bung areas. Extending around the periphery of the top panel is a V-shaped recess 60 joined to upraised wall 51 by an angular wall 59. This V-shaped recess 60 (FIG. 2) forms a ridge 62, viewed from the bottom surface, which extends around the periphery of the top panel. Initially prior to the curling operation to be described, a horizontal flange 64 having a downward turned end 65 extends around the top panel and is integrally joined to vertical wall 63 which has a bottom end forming ridge 62. FIG. 2 shows lock seam 61 which is formed by curling inward portion 65, flange 64 and flange 40 of the tubular body.

FIG. 5 is a fragmentary sectional view showing the tool 90 for producing the lock seam joining the top and bottom panels to the tubular body. The tool will be described in terms of producing lock seam 79 for joining the bottom panel to the tubular body; it being understood that a similar description applies for the making of lock seam 61 for joining the top panel to the tubular body. Tool 90 has a rotator 110 for rotating the panel and tubular member to be joined. Tool 90 also has a curler 91 which is driven into the flanges of the panel and tubular member to be joined while rotator 110 is rotating the panel and tubular member past the curler. Bottom panel 70 is mounted atop a rotatable machine table 111 having a plate 112 fixedly secured thereto. Plate 112 has a flange 113 extending around its periphery forming a cam track 114 which follows a generally rectangular path outlining the rectangular cross section of the container. A continuous support block 115 is fastened to plate 112 by standard fastening devices 116 and has an inverted V-shaped flange 117 which is complementary in shape to the V-shaped recess 76 (FIG. 2) of bottom panel 70. Surface 118 of flange 117 supports wall 80 of bottom panel 70. Tubular body 21 is then mounted atop bottom panel 70 with flange 39 resting atop flange 72 and with the edge of flange 39 being positioned inwardly of vertical end portion 73. Rotator 110 is rotated about a fixed axis (not shown) in the direction of arrow 119 and wheel 100 is advanced slowly in toward the container. Curler 91 has a bottom slide 92 with flange 93 formed at its end having a cam 94 rotatably mounted thereto by fastening device 95. The bottom slide is retained for reciprocating movement in the directions of the double arrow 91' by means (not shown). Cam 94 fits within and follows cam track 114 as plate 113 is rotated by table 111. Movable mounted to the top of slide 92 is plate 97 having ears 98 and 99 formed at its end being spaced apart to rotatably receive wheel 100 rotatably mounted thereto by fastening device 101. Wheel 100 has a wide diameter lower rim 102 integrally joined to a short diameter upper rim 104 by a curved curl producing surface 103. Plate 97 is movable with respect to slide 92 so as to slightly advance wheel 100 in toward the container each time the table 111 rotates. Any number of means may be utilized to movably mount the plate 97 with respect to slide 92 such as a worm-screw arrangement.

FIG. 6 is the same view as FIG. 5 only showing wheel 100 in the most inward position thereby forming lock

seam 79. Referring now to FIGS. 5 and 6, as the bottom panel 70 and tubular member are rotated in the direction of arrow 119, wheel 100 is advanced slowly inward eventually having portion 73 abutting curved surface 103. As the wheel is advanced further inward, the wheel will rotate and portion 73 will turn back onto flange 39. Further inward advancement of wheel 100 results in the curling of flanges 39 and 72 thereby forming lock seam 79 shown in FIG. 6. Flange 117 overhangs block 115 so as to allow lower rim 102 to slide under flange 117. Slide 92 is spaced away from plate 113 by gap 96 so as to prevent interference between the slide and plate 113 as plate 113 rotates 360°. As rotator 110 is rotating the container and panel, slide 97 is advanced slowly inward. Several revolutions are typically required of the rotator before the lock seam is completely produced. After the bottom panel has been secured to the tubular member, the bottom panel and tubular body are removed and the top panel is then mounted to the table. At this time, it is necessary to remove support block 115 and install a similar block which is configured complementary to the top panel. After the top panel has been mounted to the support block, the tubular member is once again mounted to the rotator and lock seam 61 is produced securing the top panel to the tubular member. In order to seal the end panels to the container during the production thereof, production tooling would be provided to simultaneously lock seam both end panels to the container. For purposes of effecting a liquid tight seal between the bottom panel and the tubular body and between the top panel and the tubular body, a flexible gasket 66 (FIG. 2) or sealing compound is inserted between the panels and the tubular body prior to producing the lock seams.

With regard to the stacking and nesting aspect of the container, of this invention, the top panel 50 is wider than the bottom panel 70. FIG. 7 is a side elevation of a container 125 stacked atop a container 130 both incorporating the present invention. The bottom panel 126 of the upper container has its lock seam 127 spaced inwardly sufficiently to fit within the V-shaped recess 132 of the top panel 131 of the lower container. Of course, the lock seam 133 of top panel 131 is spaced outwardly of seam 127 of bottom panel 126.

FIG. 8 is a fragmentary, enlarged view of the top left portion of container 130 and the bottom left portion of container 125 of FIG. 7. As shown, the top panel 131 of container 130 is provided with a deep recess 132 which is formed by a vertical wall 137 joined to a wall 138 which projects upwardly at an acute angle with respect to wall 137. In one embodiment of the container having a height of 35½ inches and a square cross section of 27¼ inches by 27¼ inches, the depth of recess 132 from the horizontal top wall 131 was three-fourths inches. In this same embodiment, wall 138 intersected wall 137 at a maximum included angle of 55°. A significant increase in the strength of the container results from the deep recess. In containers having a shallow recess or no recess at all, the internal pressure indicated by arrows 134, 135 and 136 will force the end panel from the container. For example, assuming recess 132 to be shallow then the horizontal component of the pressure indicated by arrows 134 will force the side panel 139 out horizontally while the vertical component of the pressure indicated by arrows 135 will force wall 138 upwardly along with wall 131 thereby rolling

out the recess and unrolling lock seam 133. By increasing the depth of recess 132 while keeping wall 137 vertical and the width of the recess approximately equal the included angle between walls 137 and 138 will decrease. As a result, the horizontal component of the pressure vector 135 will increase while the vertical component of the vector will decrease. A significant reduction in the vertical pressure component exerted against wall 138 will prevent the recess from rolling out and the lock seam from opening.

Recess 132 receives the lock seam 127 of container 125 so as to allow the containers to be stacked. The bottom wall 126 of container 125 is recessed to avoid interference with wall 131. An inverted V-shaped recess 15 is formed in wall 126 similar to recess 132.

The side wall 139 of container 125 extends downward from lock seam 133 and slopes gradually outward following a general egg shell contour as shown also for container 20 in FIG. 1. The top portion 30 of each side wall extend outward to terminus 32 whereas the bottom portion 31 of each of the side walls extend from the lower terminus 33 gradually inward to the bottom end panel.

It has been determined that a container incorporating the present invention has a high degree of strength being able to withstand relatively large pressures. The egg shell contour of the side wall of tubular body 21 in conjunction with the smooth rounded concave belt 29 extending around the center of the container eliminates the concentration of stresses within the tubular body which would normally occur as a result of sharp bends or corners in the container. It has been found that tubular body 21 is best produced by expanding metal as disclosed in my U.S. Pat. No. 3,586,204. The container main body is stiffened by the center concave belt so as not to require gussets or any embossing. The lock seams 61 and 79 in addition to sealing the top and bottom panels to the tubular body also function as bumpers or buffer rails protecting the container from damage. Immediately inward of lock seams 61 and 79 are the V-shaped recesses 60 and 76 which increase the strength of the top and bottom panels preventing the distortion which normally occurs as a result of internal pressures within the container. The V-shaped recesses provide peripheral support around the edge of the top and bottom panels. Lock seam 61 may also serve as a means for lifting the container by a lift truck.

FIG. 9 is a fragmentary perspective view of a container 140 identical with container 20 with the exception that vertically straight strengthening columns 150 are formed in concave belt 145 at each of the four lengthwise corners of the container. Belt 145 like belt 29 is symmetrical about a plane intersecting the belt midway between the upper and lower terminus (146 and 147) of the belt. The belt extends from the upper terminus 146 and the lower terminus 147 continuously and gradually to a location midway of both terminus. The strengthening columns 150 each have a top end 152 and a bottom end 151 which blend into belt 145 with the sides 153 and 154 of the column blending into belt 145. Spherical corners 149 and 148 are formed at the intersection of terminus 146 and rounded corner 142 and at the intersection of terminus 147 and rounded corner 144. Columns 150 and rounded corners 142 and 144 are of uniform radius with columns 150 being positioned inwardly of the columns and terminus 146 and 147. The top portions 141 and bottom

portions 143 of each side wall slope inwardly from terminus 146 and 147 following the egg shell contour previously described. The terminus 146 and 147 are smooth and rounded.

An alternate embodiment of the present invention is shown in FIGS. 10 and 11. FIG. 10 is a top view of a container 160 identical to container 140 with the exception that a removable lid 165 is provided. Container 160 has four side walls 161 joined together in rectangular fashion with the top ends 164 of the side walls being fixedly joined to end panel 162 by lock seam 163 identical to lock seam 61 (FIG. 1). Panel 162 has an opening for inserting or removing material from the container and is sealingly closed by removable lid 165 affixed thereto by band 166.

Panel 162 extends horizontally to location 170 (FIG. 11) where it turns upwardly forming a closed loop 171 which extends circumferentially around the opening closed by lid 165. The outer edge portion of lid 165 also turns upwardly at 168 forming a half loop 168' which receives in complementary fashion the loop 171. A rubber gasket 169 is disposed between loop 168' and 171. Band 166 extends completely around lid 165 and has a bottom leg 178 positionable adjacent to and between loop 171 and wall 162. Band leg 178 is integrally joined to leg 179 by intermediate member 180. Legs 178 and 179 are spaced apart to receive loops 171 and 168'. The opposite ends 173 and 174 (FIG. 10) of band 166 overlap and have respectively brackets 175 and 176 fixedly mounted thereto. The shank of bolt 167 extends through brackets 175 and 176 and is threadedly received by nut 177. By tightening nut 177 on bolt 167, the band is tightened so as to compress gasket 169. To remove lid 165, the bolt and band are removed and the lid is lifted from the end panel. Band 166 is spaced away from the edge of the container forming recess 172 which receives the lower lock seam of a container stacked atop container 160. The present invention includes a container such as shown in FIG. 11 which has a flat wall 162 or a wall with a V-shaped recess.

Many variations are contemplated and included in the present invention. For example, the container may be made in various sizes. In one embodiment of the container, the height of the container was 36 inches and the rectangular cross section of the container was 26½ inches by 26½ inches. This container holds 100 gallons of liquid and occupies only slightly more space than the traditional 55 gallon round barrel container. A smaller container according to the present invention holding 55 gallons and having the same cross section as the 100 gallon container is only 18 inches high. In one embodiment of the container, a single end panel was attached by lock seams to the side walls with the opposite end being conventionally attached or formed as an integral piece to the side walls. A variety of materials, such as liquids and powdered materials may be held by these containers. In these two containers, the lock seams are curled approximately to one-half inch in diameter allowing the container to be moved by lifting same immediately beneath the upper lock seam. The lock seams are compressed sufficiently so as to be a solid roll of metal.

The conventional circular cross sectional drum wastes considerable storage space when aligned in rows as contrasted to drums or containers having square cross sections. For example, a conventional 55 gallon drum has a diameter of 24 inches as compared to a 100

gallon square container with same height as the drum and having a square cross section of approximately 27 inches by 27 inches. Although the cost to produce a square container is greater than the cost of a round drum, the cost per gallon held is approximately 30 percent lower. Following is a production cost comparison chart for a typical round drum and square container.

#### CONTAINER PRODUCTION COST

	55 Gal. Round Drum 18 Gauge-51 lbs.	100 Gal. Square Container 18 Gauge-79 lbs.
Material Cost	\$4.52	\$6.79
Other Cost	2.73	3.40
Selling Price	\$7.25	\$10.19
Cost per Gallon-Container	\$0.1318	\$0.1019
% Reduction in container cost per gallon		29.34%

The railroad and trucking industries charge for the amount of space occupied during transit. Thus, the cost of shipping material in the square containers is considerably less per gallon as compared to the round drums. Padding material (dunnage) is used around the round drums due to the spaces therebetween whereas dunnage is not used around square containers. Following is a shipping cost comparison for a typical round drum and square container.

#### RAILROAD SHIPPING — EMPTY DRUMS

	55 Gal. Round Drum	100 Gal. Square Container
Quantity per 40 foot car	300	204
Total Gallons	16,500	20,400
Weight per car	15,300	16,116
Freight Tariff		
Chicago from Indianapolis (Min.)	\$191.25	\$191.25
Dunnage	26.00	—
Total Freight Cost	\$217.25	\$191.25
Shipping Cost Per Gallon	\$0.01316	\$0.00937
% Reduction in shipping cost per gallon		40%

#### TRUCK SHIPPING — EMPTY DRUMS

	55 Gal. Round Drum	100 Gal. Square Container
Quantity Per High Cube Truck	225	153
Total Gallons	12,375	15,300
Weight per truck (empty drums)	11,475	12,087
Shipping Cost class A		
Chicago from Indianapolis	\$210.00	\$210.00
Shipping cost per gallon	\$0.01696	\$0.01372
Reduction in shipping cost per gallon		24%

The lock seams provide a dual function. First, the seams join the end panels to the side walls of the container and are the load carrying members. Next, the lock seams act as bumpers so as to prevent damage to the container upon accidental impact. The egg shell contour of the side walls coupled with the lock seams provide for a fantastically strong container. The egg shell contour is defined by arcs of imaginary great circles. The side walls have a pillow-like configuration. The thickness of the walls may vary; however, best results have been obtained by having the walls of a uniform thickness. Best results have been obtained by curling the lock seams to have a spiralingly round cross section and so they are positioned inwardly of the upper and lower terminus of the concave belt.

The containers disclosed herein provide nestable, rugged and strong containers of noncircular configuration by virtue of the marriage or unique blending of several concepts. For example, an egg shell type construction is used in combination with hoop elements

and interrupted fold lines to provide a noncollapsible, nestable and rugged container, even when made in large sizes where wide expanses of relatively flat metal sheet are present. The introduction of possible lines of weakness is avoided in the forming of the instant containers from metal by the substantial elimination of continuous fold lines that ultimately could result in a failure or collapse of a container wall under normal stacking loads, etc.

For example, the continuous intermediate concave belt 145 (FIG. 9) and the normally continuous fold line 146 and 147 resulting therefrom are interrupted and the container body reinforced by the vertical support columns 150 in the area of the corners. The container corner lines are interrupted by the areas 35 and 37 (FIG. 1) at the top and bottom of the container while the hoop elements formed in the areas where the top and bottom panels are secured to the ends of the main container body considerably strengthen the container by taking full advantage of hoop tension principles. The deeper the groove 132 (FIG. 8), in an end panel within limits, of course, the better the interlock between the stacked containers again due to the utilization of hoop tension principles. The containers have generally elongated, noncircular, tubular bodies with longitudinally arcuate side panels of generous radii.

Because of the fact that no welding is required for attaching the top and bottom panels to the body section of the containers of this invention, prefinished material can be used. It will be evident from the above description that the present invention provides an improved container and a method for making same. It will be further evident that the container may be easily and conveniently stacked. In addition, it will be evident that the container has a center concave strengthening belt and is relatively stronger than prior containers without requiring gusseting or embossing.

While the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only the preferred embodiment has been shown and described and that all changes and modifications that come within the spirit of the invention are desired to be protected.

The invention claimed is:

**1. A container comprising:**

a rectangular tubular body having side walls with rounded corners joining said side walls together, said body also having a smooth continuous concave belt extending around said body with an upper and lower rounded and laterally extending terminus, each of said side walls having an upper wall portion and a lower wall portion integrally joined to said terminus and separated by said belt; and, 45  
a top panel sealingly mounted atop said body; said top panel has an outwardly disposed first flange with a downward turned tip portion extending completely around said top panel; and, 50  
said body has an outwardly disposed second flange parallel with said first flange and integrally mounted atop said upper wall portion; said first and second flange are curled together completely around said container into a solid first lock seam; and, 55  
said top panel has a continuous V-shaped recess disposed inwardly and adjacent said first lock seam;

a bottom panel having an outwardly disposed third flange with an upward turned tip portion extending completely around said bottom panel; and wherein: said body has an outwardly disposed fourth flange parallel with said third flange and integrally connected to said lower wall portion; said third and fourth flanges are curled together completely around said container into a second solid lock seam; and,

said bottom panel has a continuous inverted V-shaped depression disposed inwardly and adjacent said second lock seam.

**2. The container of claim 1 wherein:**

said belt is symmetrical about a plane intersecting said belt midway between said upper and lower terminus.

**3. The container of claim 2 wherein:**

said belt extends from said upper and lower terminus continuously and gradually to a location between said upper and lower terminus.

**4. A container comprising:**

a rectangular tubular body having side walls with rounded corners joining said side walls together, said body also having a smooth continuous concave belt extending around said body with an upper and lower rounded and laterally extending terminus, each of said side walls having an upper wall portion and a lower wall portion integrally joined to said terminus and separated by said belt; and, 30  
a top panel sealingly mounted atop said body; said upper wall portion of each of said side walls extend from said top panel gradually outwardly to said upper terminus; said container has a bottom wall; and, 35  
said lower wall portion of each of said side walls extend from said lower terminus gradually inwardly to said bottom wall; vertical strengthening columns formed in said concave belt between said upper and lower terminus, each of said columns are positioned in a corner of said rectangular tubular body; and wherein: 40  
said belt has spherical corners at the intersections of said upper terminus and said rounded corners and the intersections of said lower terminus and said rounded corners, each of said columns have top and bottom ends blended into said belt at said spherical corners.

**5. The container of claim 4 wherein:**

said belt is symmetrical about a plane intersecting said belt midway between said upper and lower terminus;

said rounded corners and said columns are of uniform radius; and,

said columns are positioned inwardly of said upper and lower terminus, said columns extend through said plane and an equal distance above and below said plane.

**6. A container comprising:**

a rectangular tubular body having side walls with rounded corners joining said side walls together, said body also having a smooth continuous concave belt extending around said body with an upper and lower rounded and laterally extending terminus, each of said side walls having an upper wall portion and a lower wall portion integrally joined to said terminus and separated by said belt; and, 60  
a top panel sealingly mounted atop said body;

a bottom panel having an outwardly disposed first flange; and wherein:  
 said top panel has an outwardly disposed second flange;  
 said body has an outwardly disposed third flange curled together with said second flange completely around said container into a solid first lock seam, said body has an outwardly disposed fourth flange curled together with said first flange completely around said container into a solid second lock seam;  
 said first lock seam and said second lock seam each have a spiralingly round cross section and are positioned inwardly from said upper and lower terminus.

## 7. A container comprising:

a rectangular tubular main body having a first inverted L-shaped top edge portion extending completely therearound; and,  
 a top lid having a first generally horizontal wall with 20 a second horizontal wall extending completely around said first horizontal wall and being integrally joined thereto by a first V-shaped wall, said V-shaped wall fitting within said first portion;  
 said main body has upper and lower side walls; and 25 further comprising:  
 a concave rounded continuous belt integrally joined to and spacing said side walls apart;  
 said first portion and said second wall are curled into a sealed first lock seam; and,  
 said upper and lower side walls have their most outward extremity adjacent said belt;  
 a bottom lid having a recessed wall with a ridge extending completely therearound and a first L-shaped flange integrally joined to said ridge; and, 30 a second L-shaped flange integrally joined to said lower side wall receiving said first L-shaped flange; said first L-shaped flange has initially an upward turned edge;  
 said first and second L-shaped flanges are curled together into a second solid lock seam; and,  
 said second lock seam of said container fits in said first V-shaped wall of a second container identical to said container in a stacked condition.

## 8. The container of claim 7 wherein:

said first V-shaped wall has a maximum included angle of 55°.

## 9. A container comprising a generally elongated tu-

bular body having longitudinally arcuate side panels of generous radii and said body being of noncircular cross-sectional configuration, said side panels being joined together with vertically extending rounded corners, each side panel being bowed outwardly between said vertically extending rounded corners, each side panel extending inwardly above and below said belt portion, panels secured to opposing ends of said body, said body having a generally concave belt portion located intermediate the ends thereof and said belt portion being provided with vertical columnar support elements located adjacent said rounded corners formed integrally with the belt, said support elements reinforcing the tubular body in the areas of the corners and causing interruptions of said belt portion in the corner areas of said container body, and said ends of said body being crimped to said panels to form container reinforcing hoop elements.

## 10. The container of claim 9 wherein:

said belt portion extends continuously around said body and has an upper terminus and a lower terminus, said belt portion has spherical corners at the intersections of each terminus and said rounded corners, each of said support elements have top and bottom ends blended into said belt portion at said spherical corners.

## 11. A method of attaching an end panel on a tubular container, said end panel having a main body with an outwardly disposed first flange extending circumferentially therearound and with a depression in said main body inwardly of and adjacent said first flange, said container having a main body with an outwardly extending second flange extending circumferentially therearound being parallel and positioned against said first flange, comprising the steps of:

locating a rigid support in said depression;  
 contacting said first flange with a continuous grooved wall extending circumferentially around a rotatably mounted wheel;  
 forcing said wheel toward said support to curl said first flange and said second flange in said grooved wall; and,  
 causing said wheel to travel around said container to curl said first flange and said second flange into a continuous lock seam extending around said container.

\* \* \* \* \*